INSTRUCTION MANUAL
FOR
TYPE WJ-9478-1 BASEBAND
RECEIVER ELEMENT

MP MASTER
MA31063

WATKINS-JOHNSON

INSTRUCTION MANUAL
FOR
TYPE WJ-9478-1 BASEBAND
RECEIVER ELEMENT

DESCRIPTION

The WJ-9478-1 Baseband Receiver Element is a modified version of the standard WJ-9478 Baseband Receiver Element that extends the tuning range to 30 MHz and has a different Input Filter Type 92494-1 (A2) to extend the input tuning range. EPROM U7 on the Type 796623-23 Microprocessor (A8) contains the software that provides the tuning range modifications. The front panel is black with silver lettering.

WATKINS-JOHNSON COMPANY
700 Quince Orchard Road
Gaithersburg, Maryland 20878

April 1988

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1.1 GENERAL DESCRIPTION

The WJ-9478-1 Baseband Receiver Element is a modified version of the WJ-9478 which allows an extended tuning range to 30 MHz. The overall frequency range of the WJ-9478-1 is 250 kHz to 30 MHz.

1.2 ELECTRICAL DESCRIPTION

The WJ-9478-1 Baseband Receiver Element is electrically identical to the WJ-9478, with the exception of the EPROM (U7) on the Type 796622-23 Microprocessor assembly and the Type 92494-1 Input Filter (A2). EPROM U7 on the Microprocessor contains the software to support the extended 30-MHz tuning range. Input Filter A2 provides the increased input bandwidth to allow frequencies up to 30 MHz to be passed.

1.3 MECHANICAL DESCRIPTION

Mechanical changes to the WJ-9478-1 Baseband Receiver Element include the black etched aluminum front panel bezel and the Type 92494-1 Input Filter Assembly (A2).

1.4 OPERATION

The remote commands to control the WJ-9478-1 are listed in **Table 2-5** of the WJ-9478 Instruction Manual. The argument for the frequency command (Fxxxxxxx) is now extended up to 3000000 to cover the extended frequency range.

1.5 CIRCUIT DESCRIPTION

1.5.1 INPUT FILTER

Input Filter Assembly A2 Type 92494-1 provides low-pass filtering for received input signals from 250 kHz to 30 MHz. Signals beyond the passband frequencies are attenuated to prevent their being processed by the Baseband Receiver Element. This low-pass filter has a DC blocking input and has a 31 MHz upper rolloff frequency.

1.5.2 1st & 3rd LO SYNTHESIZER

The 1st & 3rd LO Synthesizer operation, with the exception of the frequency range, is the same as the synthesizer in the standard WJ-9478 Baseband Receiver Element. Selection of the 1st LO VCO frequency band is now handled in eight bands.

1.6 ALIGNMENT

Alignment of the 1st LO Synthesizer VCO has changed due to the eight bands now used to support the extended tuning range. **Table 1-1** represents the VCO bands and the associated tuning voltage for each band. During alignment of the VCO, note that each adjustment affects the overall performance of the VCO. The adjustments can only be performed with the VCO cover removed. Further note that placing the cover on the VCO assembly again changes the VCO frequency considerably. Thus it is recommended that the cover be firmly held in place, by hand, after each adjustment is made to determine whether the adjustment is correct.

Perform the steps outlined in **paragraph 1.6.1** to align the 1st & 3rd LO Synthesizer. These steps should only be performed when it has been determined that this assembly is in need of alignment. Improper alignment of this assembly will result in improper operation of this unit.

1.6.1 1st & 3rd LO SYNTHESIZER ALIGNMENT

1. Place the 1st & 3rd LO Synthesizer Assembly (A5) on the extender board and connect the test equipment as illustrated by the dotted lines in **Figure 1-1.**

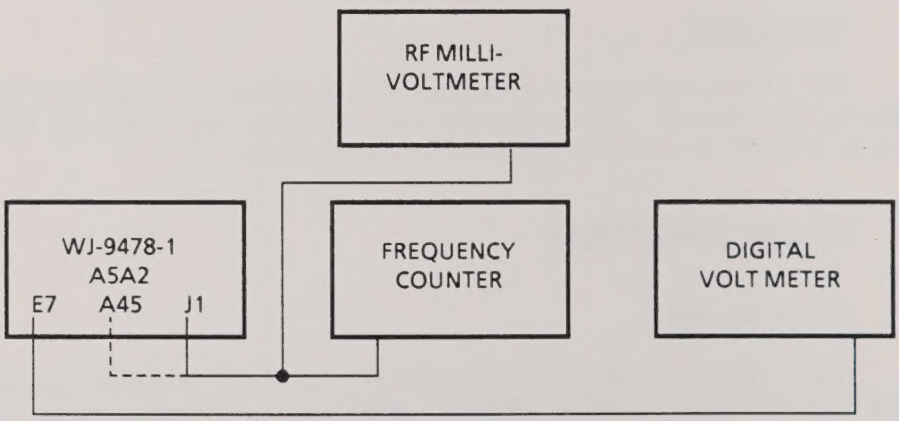

Figure 1-1. 1st & 3rd LO Syntherizer Alignment Equipment Connections

2. Verify the presence of a 1-MHz input signal at pin A45 of the 1st & 3rd LO Synthesizer Assembly (A5A2).

3. Disconnect the frequency counter and connect the test equipment as illustrated by the solid lines in **Figure 1-1.**

4. Refer to **Table** 1-1 for the tuned frequency, the associated tuning voltage, the 1st LO frequency, and the VCO frequency.

Table 1-1. VCO Alignment Parameters

VCO Band	1st LO Freq. (MHz)	Tuned Freq. (MHz)	Voltage (Typical)	Component Adjustment	VCO Freq. (MHz)
0	42.91-46.90	0 to 3.99	-8.5 to 6.0	C6 & L1	71.64-187.60
1	46.91-50.90	4 to 7.99	-7.5 to 4.1	L2	187.64-203.60
2	50.91-54.90	8 to 11.99	-7.2 to 2.8	L3	203.64-219.60
3	54.91-58.90	12 to 15.99	-5.3 to 3.9	L2 & L3	219.64-235.60
4	58.91-62.90	16 to 19.99	-6.6 to 2.7	L4	235.64-251.60
5	62.91-66.90	20 to 23.99	-6.0 to 2.2	L4 & L2	251.64-267.60
6	66.91-70.90	24 to 27.99	-6.2 to 0.4	L3 & L4	267.64-283.60
7	70.91-72.90	28 to 29.99	-5.7 to -3.0	L4, L3, & L2	283.64-291.60

5. Verify the frequency range and tuning voltage for each of the eight VCO bands. Access to the component adjustments is provided by removing the screws securing the VCO top cover.

NOTE

Installing and removing the VCO cover makes a significant change in the VCO voltage and frequency.

6. Verify the output level on the RF millivoltmeter is +20 dBm (±0.5 dB).

7. Disconnect the test equipment and reinstall the 1st & 3rd LO Synthesizer assembly into the unit.

1.7 REPLACEMENT PARTS LIST

The following parts list indicates only those components that are unique to the WJ-9478-1 Baseband Receiver Element. Parts not listed in the following parts list are identical to those found in the WJ-9478 Baseband Receiver Element and are found in **Section VI** of the WJ-9478 Baseband Receiver Element Instruction Manual.

1.7.1 TYPE WJ-9478-1 BASEBAND RECEIVER ELEMENT

MAIN CHASSIS

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A2	Input Filter	1	92494-1	14632	
A8	Microprocessor	1	796623-23	14632	
A8U7	EPROM	1	841297	14632	

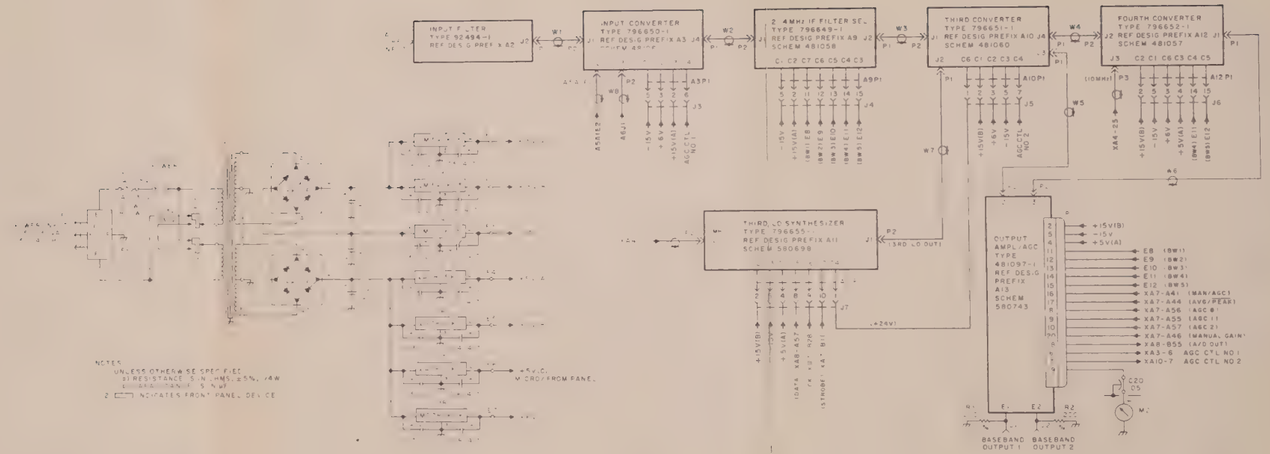

Figure 1-2. **Type WJ-9478-1 Baseband Receiver Element Schematic Diagram 580851 (Sheet 1 of 2) (01)**

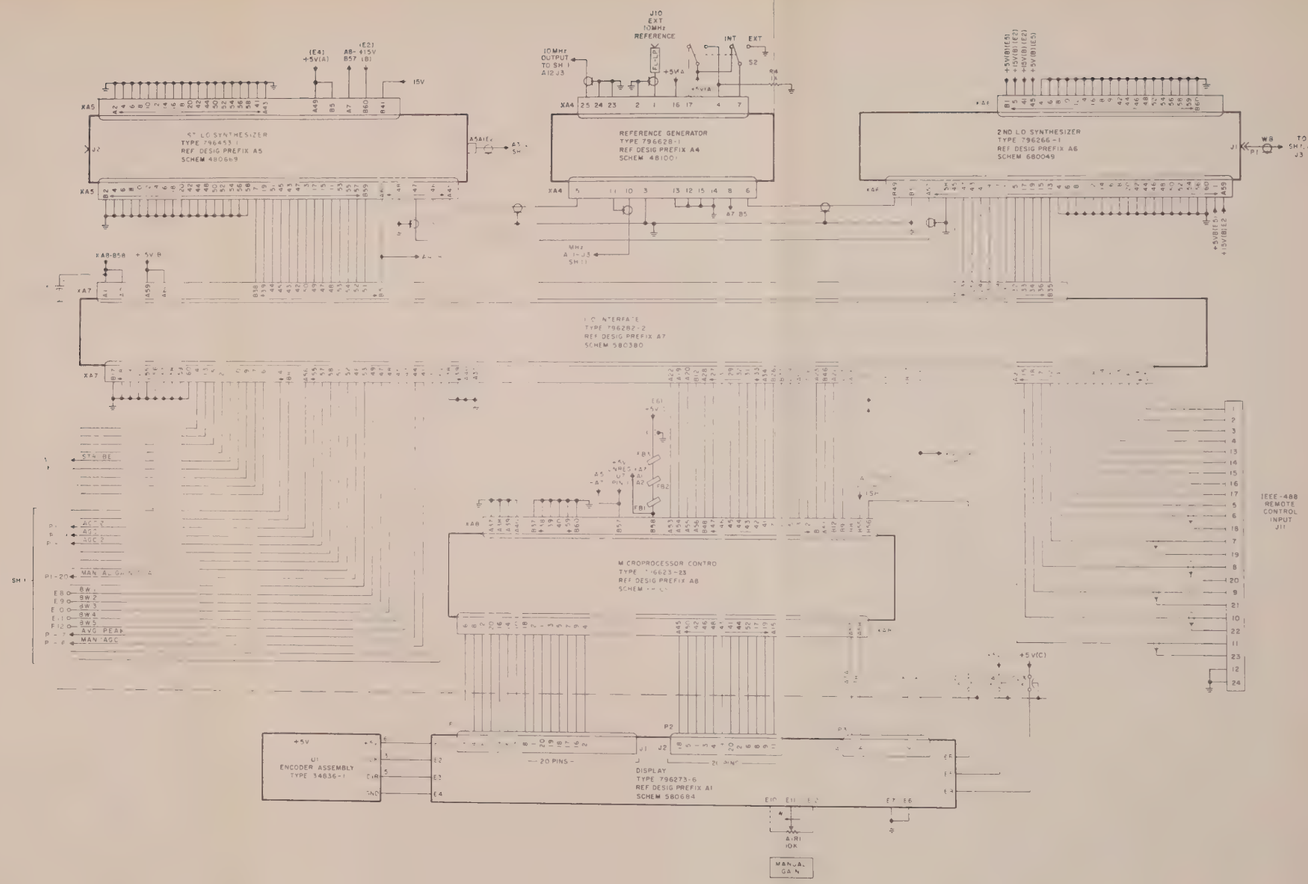

Figure 1-2. Type WJ-9478-1 Baseband Receiver Element Schematic Diagram 580851 (Sheet 2 of 2) (01)

INSTRUCTION MANUAL

FOR THE

WJ-9478 BASEBAND RECEIVER ELEMENT

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878

November 1988

WARNING

This equipment utilizes voltages which are potentially dangerous and may be fatal if contacted. Exercise extreme caution when working with the equipment with any protective cover removed.

PROPRIETARY STATEMENT

This document and subject matter disclosed herein are proprietary items to which Watkins-Johnson Company retains the exclusive right of dissemination, reproduction, manufacture and sale.

This document is provided to the individual or using organization for their use alone in the direct support of the associated equipment unless permission for further disclosure is expressly granted in writing.

EQUIPMENT MALFUNCTIONS

This unit was thoroughly inspected and factory adjusted for optimum performance prior to shipment. If an apparent malfunction is encountered after installation, verify that the correct input signals are present at the proper connectors. Prior to taking any corrective maintenance action or breaking any seals, contact your Watkins-Johnson representative, or the Watkins-Johnson Company Service Department to prevent the possibility of voiding the terms of the warranty. Contact the Watkins-Johnson Company via mail, telephone, wire, or cable at:

Watkins-Johnson Company
Company Service Department
700 Quince Orchard Road
Gaithersburg, Maryland 20878-1794

Toll Call: (301) 948-7550 Ex. 7201
TELEX: 89-8402
TWX: 710-828-0546
TELEFAX: (301) 921-9479
EASYLINK: 62928185

If reshipment is necessary, follow the instructions in the following paragraph (Preparation for Reshipment or Storage). Do not return the equipment until a Return for Maintenance Authorization (RMA) number has been obtained from the Watkins-Johnson Company's Customer Service Department. See Item 10 in the **General Terms and Conditions of Sale** paper (WJ Form # WJ-151-X) for more information on equipment returns.

PREPARATION FOR RESHIPMENT OR STORAGE

If the unit must be prepared for reshipment, the packaging method should follow the pattern established in the original shipment. Use the best packaging materials available to protect the unit during reshipment or storage. When possible, use the original packing container and cushioning materials. If the original packing materials are not available, use the following procedure:

1. Wrap the unit in sturdy paper or plastic.

2. Place the wrapped unit in a strong shipping container and place a layer of shock-absorbing material (3/4-inch minimum thickness) around all sides of the unit to provide a firm cushion and to prevent movement inside the container.

3. If shipping the unit for service, fill out all information on the 5x6 PRODUCT DISCREPANCY REPORT card (WJ Form # WJC-QA55-0) that was provided with the original shipment. Also ensure that the Return for Maintenance Authorization (RMA) number is recorded on the card. If this card is not available, attach a tag to the unit containing the following information:

   a. Return for Maintenance Authorization (RMA) number.
   b. The Watkins-Johnson Type/Model number of the equipment.
   c. Serial number.
   d. Date received.
   e. Date placed in service.
   f. Date of failure.
   g. Warranty adjustment requested, yes or no.
   h. A brief description of the discrepant conditions.
   i. Customer name and return address.
   j. Original Purchase Order/Contract number.

4. Thoroughly seal the shipping container and mark it **FRAGILE.**

5. Ship to:

   Watkins-Johnson Company
   700 Quince Orchard Road
   Gaithersburg, Maryland 20878-1794
   U.S.A

When storing the equipment for extended periods, follow the above packing instructions to prevent damage to the equipment. The safe limits for storage environment are:

Temperature: -40 to +70°C
Humidity: less than 95%

WJ-9478 BASEBAND RECEIVER ELEMENT INSTRUCTION MANUAL

REVISION RECORD

REVISION	DESCRIPTION	DATE
A	Initial issue.	10/87
B	Reflects change to center frequency of 100 kHz bandwidth from 200 kHz to 125 kHz.	3/88
C	Reprint. Incorporates Revision B and updated drawings and parts lists.	11/88

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SECTION I

GENERAL DESCRIPTION

Figure 1-1. WJ-9478 Baseband Receiver Element

SECTION I

GENERAL DESCRIPTION

1.0 GENERAL DESCRIPTION

1.1 ELECTRICAL CHARACTERISTICS

The WJ-9478 Baseband Receiver Element is a tunable down-converter with an input frequency range from 250 kHz to 15 MHz. The output center frequency is dependant upon the IF bandwidth selected; refer to **Table 1-1** for a list of the output center frequencies. The lowest practical center frequency is used in each case. This unit is ideal for use as a tunable downconverter ahead of a digital signal processing unit or for use as a tunable IF to tape converter. The signal processing path has been optimized so that there are no spurious products either internally or externally generated that are less than 50 dB down. Five IF bandwidths are provided, each with good phase linearity across the center 80 percent of the passband.

All internal local oscillators are phase locked to a master reference frequency. When the internal reference is used, the stability is better than ± .2 PPM over the full temperature range. There is also a provision for use of an external reference when a system requires it. Tuning resolution is 100 Hz. Tuning may be accomplished from the front panel by direct keypad numeric entry or by turning the frequency knob on the front panel. Remote control of the tuning is also possible.

Remote control of all parameters is provided for via the IEEE-488 connector provided on the rear panel. Frequency, IF Bandwidth, Manual gain, AGC mode and AGC time constant are all controllable from the remote port. Status of the unit can also be queried and the WJ-9478 will respond with the parameters that the unit is set to, regardless of whether local or remote control is used.

1.2 MECHANICAL CHARACTERISTICS

The WJ-9478 Baseband Receiver Element is designed to be mounted in a standard 19 inch rack cabinet, and occupies 5.22 inches of vertical rack space. The unit depth into the rack is 21.5 inches. All major chassis components, side panels, dust covers, compartment dividers, main deck, front and rear panels, are made of aluminum. The exceptions are the Nickle Plated Brass Input Converter subassembly and cover, Input Filter, IF Filter/Selector, 3rd Converter, 3rd LO Synthesizer, 4th Converter, and Input Filter.

A light green painted aluminum plate with silk screened control functions is attached to the front panel. Power switch, tuning knob, Manual Gain Control and Signal Level Meter are mounted directly to the front panel. All other controls are mounted on printed circuit boards which are mounted to the front panel. An exception is the Internal/External switch which is mounted on the rear panel.

All input/output connectors are located on the rear panel of the unit. BNC connectors are used for all of the input/output connections, except for the AC power connector and IEEE-488 Remote bus connector. On the right side of the rear panel is located the AC power connector, active and spare fuses.

Top and bottom dust covers are secured with quarter-turn fasteners. Removing the top cover allows access to the various subassemblies used in the Baseband Receiver. Unit wiring, regulated power supply voltages, and pin contacts for the printed circuit assemblies are accessible by removing the bottom dust cover.

1.3 EQUIPMENT SUPPLIED

Supplied equipment consists of the WJ-9478 Baseband Receiver Element and the following items:

Detachable 6 Foot Power Cord
Extender Board
Printed Circuit Board Puller

1.4 EQUIPMENT REQUIRED BUT NOT SUPPLIED

To obtain maximum utilization of the WJ-9478 Baseband Receiver Element, the following equipment should be used.

1. IEEE-488 Compatible Remote Controlling Device. (Remote Operation)

2. Hewlett Packard #10833, 2 meter cable (Remote Operation)

Table 1-1. WJ-9478 Baseband Receiver Element Table Of Specification

Item		Specification
Input Frequency Range		250 kHz to 15 MHz
Tuning Resolution		100 Hz
LO Stability		± 0.2 ppm (within operating temperature range)
Input Impedance		50 ohms (1.5: 1 VSWR Max.)
Input Level		-50 to -5 dBm (CW equivalent)
Input Passband Flatness		1.5 dB P-P maximum gain variation (250 kHz - 15 MHz)
IF BW	Output Center Frequency	Frequency/BW Limit
100 kHz	125 kHz	250 kHz
150 kHz	125 kHz	325 kHz
300 kHz	200 kHz	400 kHz
1000 kHz	800 kHz	750 kHz
2400 kHz	1600 kHz	1450 kHz

Table 1-1. WJ-9478 Baseband Receiver Table Of Specification (Continued)

Item	Specification
Internally generated harmonics of input signal	≤50 dBc
Single tone intermodulation products	≤50 dBc
Two tone intermodulation products	≤50 dBc
Image rejection (all conversions)	≤55 dBc
Aliasing Suppression	30 dB min.
Phase Linearity (80% of selected BW)	±15 deg.
Signal-to-noise ratio (-5 dBm input)	65 dB
Outputs (2 independent identical BNC)	+10 dBm
Output impedance (each)	50 ohms (1.5: 1 VSWR max.)
Output video filtering	automatically switched to match selected IF BW
Gain Control	AGC Peak, AGC AVG, Manual 45 dB range, front panel or remote
AGC Time Constants: Average, Peak	5 time constants, front panel or remote: 1, 3, 10, 30, 100 msec for 10 dB step
AGC Stability	1.5 dB for -50 to -5 dBm input change
LO Leakage (at RF input)	-100 dBm
Remote Interface	IEEE-488 connector and interface
Line Voltage Requirement	115/230 Vac ±10%, 50-400 Hz
Power Consumption	Approximately 65 Watts
Dimensions	Width 19 inches (48.2cm) Length 23.5 inches (160 cm) Height 5.22 in. (13.25 cm)
Environment:	
Temperature (Operational)*	55 to 105 degrees F (12.8 to 40.5C)
Temperature (Non-Operational)	40 to 160 degrees F (4.4 to 71C)
Weight	45 lbs (20.4 kg) (15.88 kg)

*Specifications guaranteed at 66-72 degrees F (18.9 to 22.2 C)

SECTION II

INSTALLATION AND OPERATION

SECTION II

INSTALLATION AND OPERATION

2.0 INSTALLATION AND OPERATION

2.1 UNPACKING AND INSPECTION

Upon receipt of the shipment, examine the shipping container for any visible signs of damage before unpacking the equipment. If the shipping container is visibly damaged, attempt to have the carrier's agent present when the equipment is unpacked. If the carrier's agent cannot be present while unpacking the equipment and equipment damage is discovered, retain all packing materials and the shipping container for the carrier's inspection. Also verify that the received equipment is complete as listed on the packing slip. If any discrepancies or shortages are discovered, contact the Watkins-Johnson Company, Special Products Division, or your Watkins-Johnson representative.

2.2 INSTALLATION

The WJ-9478 Baseband Receiver Element is designed for mounting in a standard 19 inch rack. The unit occupies 5.22 inches of vertical rack space and extends 21.5 inches into the rack. Do NOT rely entirely on the front panel mountings to support the unit. The use of Jonathan, Type QD110 slides, mounted on the sides of the unit are preferred. Acceptance holes are provided on the sides of the Receiver to mount the slides. Allow air flow through the top and bottom covers of the Receiver, by providing the 1.75 inch recommended environmental space above and below the Receiver.

Before connecting the power cable to the line power, check the power input switch S3, to make sure that it is in the correct position for the line voltage to be used. Also check to make sure that fuse holder F1 contains a 1 amp slo-blow fuse if 115 volt power is to be used, or a 1/2 slo-blow fuse if 230 volts is to be used.

Prior to installing the Receiver in its final location, inspect DIP switch S1, on the I/O Interface Assembly (A7) to be sure that the switches are set properly. Refer to **Table 2-1** for the S1 address settings. The address selected with switch S1 becomes the "default" IEEE-488 bus address, should the receiver memory be lost for any reason. The following steps outline the procedure required to set the Baseband Receiver Element remote address.

1. If power is "ON", turn the WJ-9478 power "OFF".
2. Press and hold the "REM/LCL" key.
3. Turn "ON" the WJ-9478 power switch, to "ON".
4. The Baseband Receiver Element tuned frequency window displays, "488- XX", where XX represents a number between 00 and 30, in decimal.
5. Release the "REM/LCL" key.

NOTE

The IEEE-488 address MUST be entered via the front panel. Switch S1 is read only if memory is lost.

If the number of the address displayed is the desired address, press the "CLR" key of the keypad. This allows the present address to remain in memory and returns the WJ-9478 to normal operation.

If the address shown on the display needs to be modified, press either the "UP" or "DN" keys of the keypad to step the address to the desired address value. When the address displayed is the correct address, release the UP/DN key and press the "CLR" key, storing the new address in memory and returning the Baseband Receiver Element to normal operation.

Check the setting of the "INT/EXT" switch (S2), on the rear panel of the WJ-9478, to be sure the reference source that is desired has been selected. Location of this switch and the other switches and connectors on the rear panel is illustrated in **Figure 2-1. Table 2-2** and the paragraphs which follow describe the connectors, the controls, and the indicators.

2.3 EQUIPMENT MALFUNCTIONS

This unit was throughly inspected and factory adjusted for optimum performance prior to shipment. If an apparent malfunction is encountered after performing the recommended installation procedures, verify that the correct input signals are present at the proper locations. Check to insure that the INT/EXT switch is in the INT position and that the Voltage Selector Switch is in the proper position to match the AC power being used. Prior to taking any corrective maintenance action or breaking any seals, contact your Watkins-Johnson representative or the Watkins-Johnson Company, Special Products Division, Gaithersburg, Maryland to prevent the possibility of voiding the terms of the warranty.

Table 2-1. WJ-9478 Baseband Receiver Element Address For Remote Control Switch S1 on the I/O Interface (A7)

Switch	5	4	3	2	1	Address
	0	0	0	0	0	0
	0	0	0	0	1	1
	0	0	0	1	0	2
	0	0	0	1	1	3
	0	0	1	0	0	4
	0	0	1	0	1	5
	0	0	1	1	0	6
	0	0	1	1	1	7

Table 2-1. WJ-9478 Baseband Receiver Address For Remote Control Switch S1 on the I/O Interface (A7) (Continued)

Switch	5	4	3	2	1	Address
	0	1	0	0	0	8
	0	1	0	0	1	9
	0	1	0	1	0	10
	0	1	0	1	1	11
	0	1	1	0	0	12
	0	1	1	0	1	13
	0	1	1	1	0	14
	0	1	1	1	1	15
	1	0	0	0	0	16
	1	0	0	0	1	17
	1	0	0	1	0	18
	1	0	0	1	1	19
	1	0	1	0	0	20
	1	0	1	0	1	21
	1	0	1	1	0	22
	1	0	1	1	1	23
	1	1	0	0	0	24
	1	1	0	0	1	25
	1	1	0	1	0	26
	1	1	0	1	1	27
	1	1	1	0	0	28
	1	1	1	0	1	29
	1	1	1	1	0	30

0 = Switch Open
1 = Switch Closed

NOTE

The IEEE-488 address set with switch S1 is used by the WJ-9478 ONLY if processor memory has been lost. The Baseband Receiver Element IEEE-488 remote address MUST be set using the procedure described in **paragraph 2.2.**

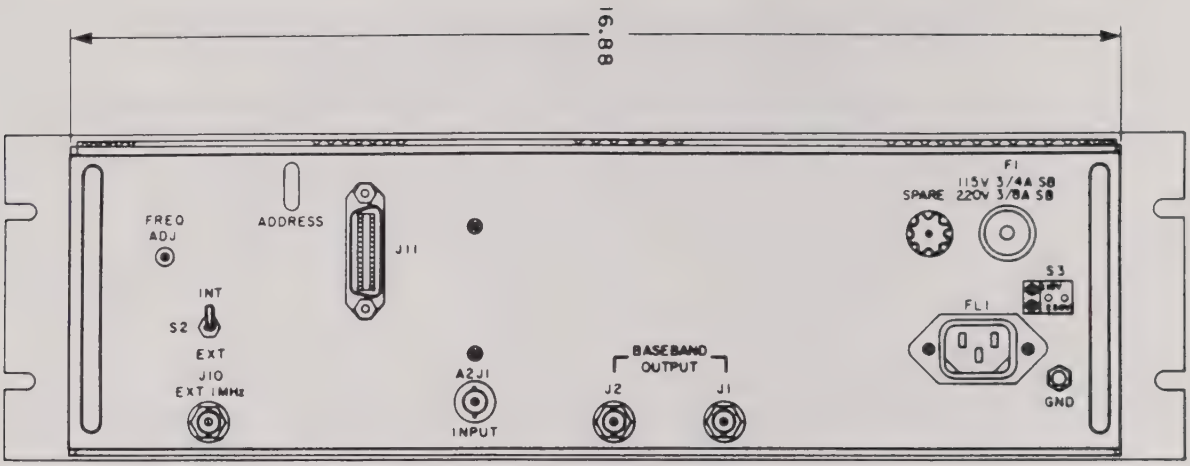


Figure 2-1. WJ-9478 Baseband Receiver Element Rear Panel

Table 2-2. WJ-9478 Connectors

Jack No.	Label	Type	Purpose
J1	Aux Output	BNC	Auxillary Output
J2	Output	BNC	Output Connector
	NOTE		
	Designators J3 Through J9 Not Used		
J10	Ext. 10 MHz	BNC	External 10 MHz In
J11	(Not Marked)	SPC	IEEE-488 Connector
A2J1	INPUT	BNC	Baseband Signal Input
FL1	FL1		3 Prong AC Primary Input

Maintenance and troubleshooting of the unit can be aided by following the suggestions and procedures described in **Section IV.** Prior to providing corrective maintenance which would cause an inspection seal to be broken, voiding the written warranty, contact your Watkins-Johnson representative or the Watkins-Johnson Company, SP Division, Gaithersburg, Maryland.

2.4 OPERATION

The WJ-9478 Baseband Receiver may be operated locally through use of the front panel, or remotely over the IEEE-488 bus by a Remote Controlling Device. Data is entered through a front panel mounted keypad, tuning control and Manual Gain control. Indicators are provided for indicating selected IF bandwidth, AGC, Gain Control, Signal Strength, Tune Frequency, Freq/BW Limit, AGC Selection, Manual Tuning Rate, Time Constant Selected and Remote.

2.4.1 CONTROLS AND INDICATORS

The controls and indicators used on the WJ-9478 Baseband Receiver Element are listed with short descriptions in **Table 2-3.** More complete descriptions will be found in the following paragraphs.

2.4.1.1 Power (S1)

This is a toggle switch located on the front panel. Line power is applied to the Baseband Receiver when the switch is placed in the up (ON) position. The down position removes the AC power from the internal circuits.

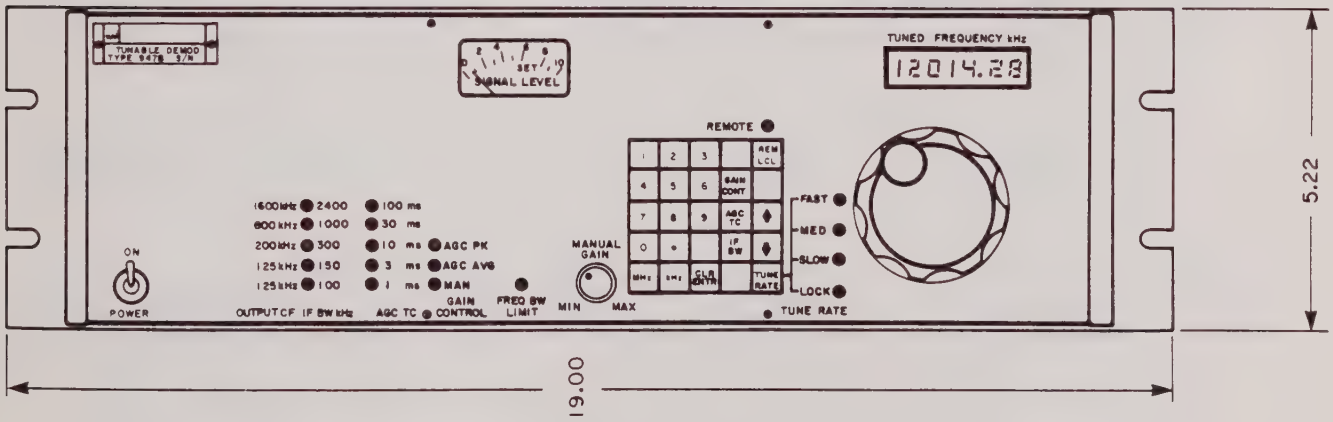


Figure 2-2. WJ-9478 Baseband Receiver Element Front Panel

2.4.1.2 Manual Gain Control - A variable potentiometer used for manual adjustment of the Baseband Receiver output level during the Manual Gain control mode. This knob provides 45 dB of manual gain control.

2.4.1.3 Tuning Wheel - The tuned frequency of the WJ-9478 Baseband Receiver may be adjusted/set with this wheel. The tuning rate may be changed using the keypad.

Table 2-3. Table of Controls And Indicators

Control/Indicator	Description
Power ON/OFF	AC Power ON/OFF Toggle Switch
Manual Gain Control	Adjusts Baseband Receiver Output Level
Tuning Wheel	Provides Manual Tuning of Unit at a rate selected with Arrow Buttons
INT/EXT Switch (S2)	Selects Internal or External 10 MHz Reference Signal
AC Voltage Switch (S3)	Selects either 115 or 230 volt AC supply voltage input
Frequency Adjust	Screwdriver adjustment for local 10 MHz MHz Internal Reference Oscillator
Signal Level Meter	Displays Baseband Receiver Signal level
IF BW kHz LED's	Individual LEDs which indicate the selected IF Bandwidth
AGC TC LED's	Individual LEDs which indicate the selected AGC Time Constant
Gain Control LED's	Individual LEDs which indicate the type of Gain Control Method selected
FREQ/BW Limit LED	Led which is illuminated when the IF BW verses tuned frequency limit has been exceeded
Tuning Rate LED's	Individual LEDs which indicate the tuning rate selected
Remote LED	An LED which illuminates when the REMOTE operating mode is selected
Tuned Frequency Display	A window which displays the tuned frequency, readable to 10 Hertz
Keypad Buttons:	25 button keypad, (several not used), for local operation
Numerical Buttons	Digits 0-9 plus decimal point
MHz	Enters the numerical input as MHz
kHz	Enters the numerical input as kHz
CLR ENTR	Clears a keypad entry error
Gain Control	Enables selection of Gain Control method by UP or DOWN buttons
AGC TC	Enables selection of AGC Time Constant by UP and DOWN buttons
IF BW	Enables selection of IF Bandwidth by the UP and DOWN buttons
REM/LCL	Toggle which alternately selects REMOTE or LOCAL mode of operation
Tune Rate	Enables selection of Tuning rate by the UP and DOWN buttons
UP/DOWN Arrows	Used for selecting: Gain Control Mode IF Bandwidth AGC Time Constant Tuning Rate

2.4.1.4 **INT/EXT Switch (S2)** - This is a toggle switch used to select either the internal 10 MHz Reference signal or an external 10 MHz the input level should be 0 dBm. A reference source which should be connected to the External Input BNC connector, (J10), if external reference operation is required.

2.4.1.5 **AC Voltage Switch (S3)** - Either 115 or 230 volts AC may be used as the primary voltage source. Switch S2, located on the rear panel makes selection of primary power, depending on the AC voltage available. A cover lock is used to prevent accidentally changing the switch selection. To change the line voltage, remove two screws from cover lock, switch the toggle to the other position, replace the fuse with the proper one and re-install the cover and secure with the two screws.

2.4.1.6 **Frequency Adjust** - A screw driver adjustment located just behind the rear panel of the unit, accessible through a hole in the panel. This adjustment permits fine adjustment of the internal 10 MHz Reference. (See **Section IV** for more information on this adjustment.)

2.4.1.7 **Signal Level** - The Baseband Receiver signal level is displayed on the front panel Signal Strength meter.

2.4.1.8 **IF BW kHz** - The five (5) LEDs provide a visual indication of the IF bandwidth which has been selected by either LOCAL or REMOTE control. The bandwidth LED corresponding to the selected bandwidth will be illuminated. The LED's provide indication of 2400, 1200, 300, 150 and 100 kHz bandwidth selections.

2.4.1.9 **AGC TC** - Five (5) LEDs are provided for visual indication of selected AGC time constants. They indicate either a 100, 30, 10, 3 or 1 milli-second time constants.

2.4.1.10 **Gain Control Indicators** - Three LEDs are provided for indication of the selected Gain Control method. The methods which are indicated are AGC PK, (AGC Peak), AGC AV, (AGC Average), or MAN, (Manual). The illuminated LED corresponds to the selected AGC Gain Control method.

2.4.1.11 **FREQ/BW Limit** - An LED is located on the front panel which is designed to signal the operator that a tuned frequency verses bandwidth combination has been selected which is outside of the specified frequency/bandwidth limit. The Baseband Receiver is not made inoperative under these circumstances, but the operator is advised.

2.4.1.12 **Tuning Rate Indicators** - Four (4) Tuning Rate Indicator LEDs are located near the Frequency Tuning Wheel. These provide visual indication of the presently selected tune rate of the Tuning Wheel. Three rates are provided and the Wheel may be locked out, to disable the Tuning Wheel. (See "Keypad" paragraphs for explanation of selecting Tuning Rates.)

2.4.1.13 **Remote Indicator** - A visual indication is provided by this LED when the Baseband Receiver is placed in the "REMOTE" operating mode.

2.4.1.14 **Tuned Frequency Window** - A decimal display is provided for indication of the tuned frequency of the Baseband Receiver. The readout is in Kilohertz, readable to 100 Hertz.

2.4.1.15 **Keypad Buttons** - A 25 button keypad is used to provide selection of operating parameters and numerical input. Several of the keypad buttons are not used and these have no markings on the button.

Numerical Buttons	Ten numerical keypad buttons are provided, numbers 0 through 9. In addition, a decimal point (period) is provided.
MHz Button	The MHz select keypad button sets the value of numerical entries so that input will be in Mega Hertz.
kHz Button	The kHz select keypad button sets the value of numerical entries so that input will be in kiloHertz.
CLR ENTR Button	When an error is made entering data on the keypad, this button will clear the entry, which then may be entered again.
GAIN CONT Button	After the Gain Control Keypad button is pressed, the UP and DOWN keypad buttons will run through the three gain control modes. These modes are "MAN", "AGC PK", and AGC AV".
AGC TC Button	After pressing the AGC Time Constant keypad button, the UP and DOWN keypad buttons are used to select Time Constants 1 through 5.
IF BW Button	The IF Bandwidth Button (after being pressed), permits the UP and DOWN keypad arrow button to select the desired bandwidth.
REM/LCL Button	The Remote/Local button is a toggle, which alternately selects Remote and Local operation. Note that when Remote is selected, NO OTHER keypad button will function.
Tune Rate Button	Enables the Tuning rate function and permits the UP and DOWN arrow buttons

to select FAST, MED, SLOW or LOCKED mode for the Tuning Wheel.

Arrow Buttons — An UP and a DOWN arrow button is provided on the keypad. These are used for selecting:

1/ Gain Control Mode
2/ IF Bandwidth
3/ AGC Time Constant
4/ Tuning Rate

2.4.2 LOCAL OPERATION

All functions of the WJ-9478 Baseband Receiver Element are controlled from the front panel. The controls discussed in **paragraph 2.4.1** and listed in **Table 2-3** are used for operating the Baseband Receiver under Local control. The following Table of Local Control Operation (**Table 2-4**), may be used as a guide in operating the unit.

Table 2-4. Local Control Operation

Parameter	Selection Sequence
AC Power	AC Power Toggle switches (S1) is moved to the "UP" position
Tune Frequency (Wheel)	Select Tuning Rate First. Press the Tuning Rate Keypad button, the UP or DOWN keypad button to rate. Then use the Tuning Wheel to select frequency.
Tune Frequency (Keypad)	Use Keypad numerical buttons to enter desired frequency digits. Then press either kHz or MHz button to enter digits in kHz or MHz.
Selecting IF Bandwidth	Press IF Bandwidth Keypad button - Then use UP or DOWN button to select desired Bandwidth.
Selecting Gain Control Mode	Press Gain Control Keypad button - Then use UP or DOWN button to select Gain Control mode.
Selecting AGC Time Constant	Press the "AGC TC" Keypad button - The use UP or DOWN button to select desired AGC Time Constant.
Local or Remote Mode	Press the "REM/LCL" Keypad button to select Local or Remote operational mode.
Keypad Entry Error	Press the "CLR" Keypad button, then re-enter data.
Change AC Input Voltage	Use AC Input switch S3 (on rear panel), to select the proper input voltage. (Note switch toggle is held in place by screw held cover.)

2.4.3 REMOTE OPERATION

The WJ-9478 Tuner/Demodulator is connected to an external controlling device (host), using an IEEE-488-1978 standard) interface. The WJ-9478 implements the IEEE-488 supported functions listing **Table 2-5.** An IEEE-488 connector is illustrated in **Figure 2-3.**

Make sure the correct address is entered for the IEEE-488 address using the dip switch, as outlined in **paragraph 2.2,** before operating the Baseband Receiver Element by remote control. Also, check the software IEEE-488 address in memory to be sure it is set to the desired bus address. The procedure for checking the software address, is also described in **paragraph 2.2.**

Figure 2-3. IEEE-488 Bus Connector Diagram

The following information should be kept in mind when operating the WJ-9478 Baseband Receiver Element by a remote controller device. The Baseband Receiver must be placed in the remote mode before it will respond to remote commands.

1. Commands may be strung together. This allows a series of commands to be sent as a group, instead of sending each command separately. A space may be inserted.

   i.e. "R B1 F0100000 A T1"

Table 2-5. WJ-9478 Remote Control Commands/Descriptions and Ranges

Command	Description	Range (kHz)
A	Select AGC Average*	
Bx	Select IF Bandwidth*	x = 1 - 5 Where: 1 = 100 Hz 2 = 150 kHz 3 = 300 kHz 4 = 1200 kHz 5 = 2400 kHz
Fxxxxxxx	Select Tuned Frequency*,**	Where: x = 0000000 1500000
L	Select Local Control	
Mxxx	Select Manual Gain Control*,***,****	x = 000 - 255
P	Select AGC Peak*	
R	Select Remote Control	
Sx	Increment/Decrement Manual Gain*	x = ±
Tx	Select AGC Time Constant*	x = 1 - 5 Where: 1 = 1 mSec 2 = 3 mSec 3 = 10 mSec 4 = 30 mSec 5 = 100 mSec

Notes:

* The WJ-9478 must be in Remote in order to process this command.

** The Frequency value must have the least significant byte (10 Hz Position) zeroed. If not, then the unit will issue an SRQ and return an error poll response.

*** The Manual Gain Command will place the unit into manual gain control and if followed by a 3 digit value (xxx), it will set the gain value to a number between 0-255. (One increment represents approximately 0.2 dB.) If no digits follow the "M" or an invalid value is given, the Baseband Receiver will use the last valid gain value.

**** The gain value of 0 represents the maximum gain level. The gain value of 255 represents the minimum.

Maximum string size is:

32 bytes if an EOI is used, and
30 bytes if a <CR> <LF> is used

WHERE ZEROS ARE SHOWN - THEY ARE REQUIRED

With the exception of the unit being required to be in Remote, the order of commands in the string is unimportant.

2. A command or command string should be terminated with a <CR> or <LF> (ASCII OD and OA).

3. Commands are NOT echoed back to the Remote Controller. Software response is limited to STATUS Information. (See below.)

4. All commands and response are ASC11.

5. The unit MUST be in Remote for ALL commands except a "Status Query".

6. The Baseband Receiver Element remote address MUST be set by using the front panel controls. This procedure is described in **paragraph 2.2.**

An illustration of the WJ-9478 Baseband Receiver Element and a Host computer are shown connected in **Figure 2-4.**

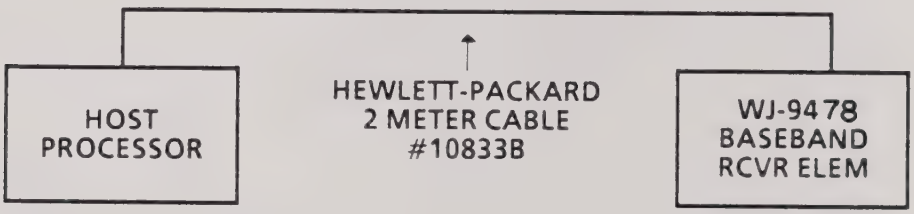


Figure 2-4. Illustration of WJ-9478 and Host Connection

2.4.3.1 **Query Responses From The Baseband Receiver**

The Receiver responds only to a request for STATUS Information. This is initiated by making the controlling device a listener and the Receiver a Talker. A single receiver status response will be returned as soon as the receiver is made a Talker. The response will be in the following format. (Also see **paragraph 2.4.3.2.**)

BxGxFxxxxxxxxxSxxxMxxxTxRx <CR> <LF>

The Receiver responds only to the Query Command for STATUS Information. (See **paragraph 2.4.3.2**).

2.4.3.2 Status Information

Status information is the only software response from the Baseband Receiver to the Remote Controlling Device. The status information is sent, when requested by the Remote Device, in the following format:

BxGxFxxxxxxxSxxxMxxxTxRx <CR> <LF>

Where:

Bx = IF Bandwidth Selected (x = 1, 2, 3, 4, or 5)

1 = 100 kHz 2 = 150 kHz 3 = 300 kHz 4 = 1200 kHz 5 = 2400 kHz

Gx = Gain Control Selected (x = 1, 2, or 3)

1 = Manual Gain Control 2 = AGC Average 3 = AGC Peak

Fx = Tuned Frequency (x = 0000000 - 1500000)

Sx = Signal Strength (x = 000 - 255)

Mx = Manual Gain (x = 000 - 255)

Tx = Time Constant Selected (x = 1, 2, 3, 4, or 5)

1 = 1 mSec 2 = 3 mSec 3 = 10 mSec 4 = 30 mSec 5 = 100 mSec

Rx = Remote/Local Status (x = 0 or 1)

0 = Local Control (Front Panel Control)

1 = Remote Control

2.4.3.3 Status Information Notes

The following information should be kept in mind about the status report on Baseband Receiver operation:

1. The Status Information can be acquired with the Baseband Receiver in either Remote or Local control.

2. Signal Strength/Gain Control information

   a. When in AGC mode, the meter will indicate the AGC level.

   b. When in Manual gain control mode, it will indicate the Baseband output level, which is a peak reading.

3. The Signal Strength level will always be a value between 0 and 255, with 255 being the maximum. The value of 188 corresponds to a level of about +10 dBm (+/- 2 V P-P).

4. When in Manual Gain Control mode, and the Baseband Receiver is being operated under Local control, the gain information is a reflection of the Front Panel manual gain control knob.

5. When operated in Remote, the value is the last valid gain word sent or the default value of 255.

2.4.3.4 Errors

Any input message received which results in an error will cause the unit to assert "SRQ". The byte returned when serial polled, will be "decimal 71". Once polled, the unit will drop "SRQ" and clear it's serial poll byte.

2.5 PREPARATION FOR RESHIPMENT

If the unit is to be prepared for reshipment, follow the packaging methods established in the original shipment. If the original packaging container and materials have been retained, and are in good condition, they may be reused or at least provide guidance for the repackaging effort.

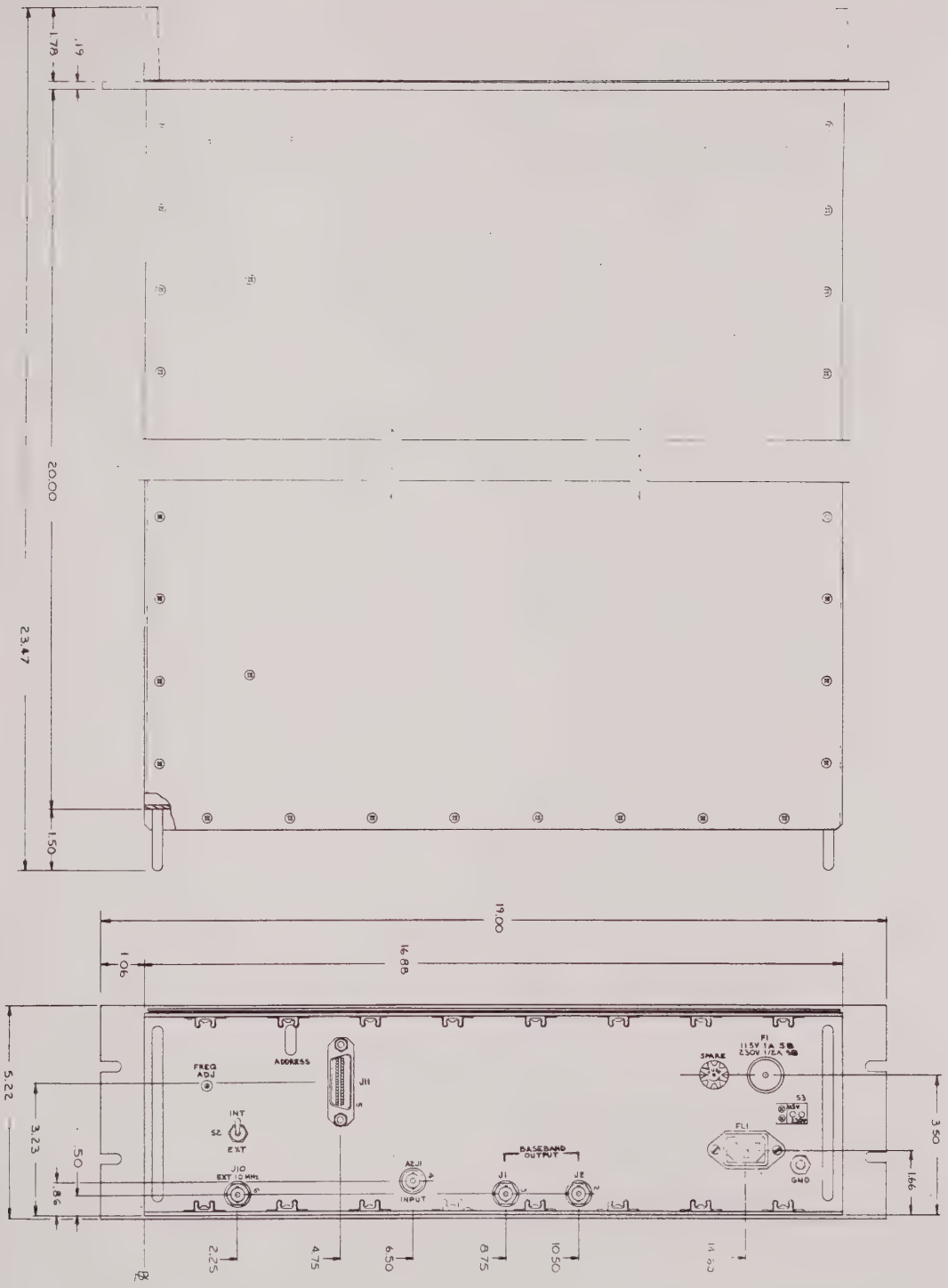


Figure 2-5. WJ-9478 Baseband Receiver Element Outline Drawing

SECTION III

CIRCUIT DESCRIPTION

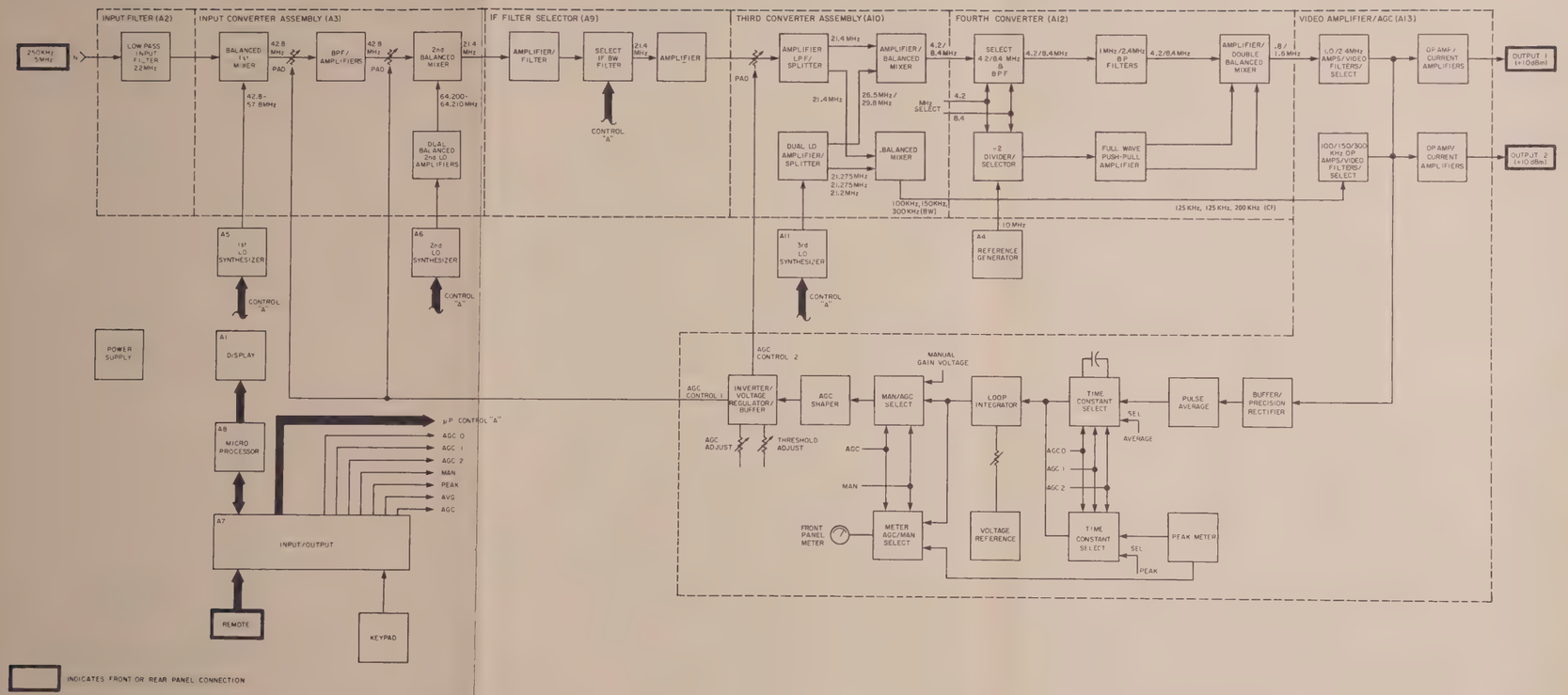


Figure 3-1. WJ-9478 Baseband Receiver Block Diagram

SECTION III

CIRCUIT DESCRIPTION

3.0 GENERAL DESCRIPTION

The following paragraphs describe the major sections of the WJ-9478 Baseband Receiver Element and explain the function of each subassembly of the section. For ease of explanation of the overall unit, the General Description is divided into a number of sections. The sections are, the RF/IF, 3rd and 4th Converters, Output Amplifier/AGC, Digital Control and Power Supply. These are described at approximately Block Diagram level. An overall Block Diagram of the Receiver is provided in **Figure 3-1** on page 3-0. Note that schematic diagrams are provided for the detailed circuit description in **paragraph 3-2** of this manual.

A numerical identification method is utilized throughout the WJ-9478. The subassemblies, modules and all electrical components are identified with an alphanumerical designation. For example A11Q1, designates Q1 on the 3rd LO Synthisizer board (A11) as the part being described. Assemblies within subassemblies are identified by adding another prefix to the component designation. Therefore, A5A1R3 would designate R3 on board A1, located on board assembly A5.

3.1 FUNCTIONAL DESCRIPTION

The WJ-9478 Baseband Receiver Element is a tunable frequency converter, covering the 250 kHz to 15 MHz frequency spectrum. Depending on the selected IF bandwidth, one of five output frequencies (between 125 kHz and 1600 kHz) is provided. The output center frequency has been selected to provide the lowest practical center frequency, consistent with the bandwidth selected. This is an important consideration for IF-to-tape conversions or when used as the "front end" for digital signal processing.

Received signals between 250 kHz and 15 MHz present at input connector A2J1 are applied to the Input Filter (A2). Input Filter A2 is a low pass filter with a roll-off frequency of approximately 22 MHz. The Input Filter limits the input frequency and prevents LO conduction out of the RF input from being applied to the Input Converter. Signals passed through A2 are applied to connector J1. Received signals (250 kHz to 15 MHz) are mixed with the 1st LO Synthesizer (A5) frequency (43.06 MHz to 57.8 MHz) to produce the 1st IF of 42.8 MHz. After being bandpass filtered and amplified, the 42.8 MHz 1st IF is mixed with the 64.200 MHz to produce the 21.4 MHz 2nd IF. In addition to converting the input frequency to the 21.4 MHz IF, the Input Converter assembly provides the WJ-9478 Baseband Receiver Element with 100 Hz tuning resolution.

Second IF signals are applied from the Input Converter to the IF Filter Selector (A9). Using the front panel keypad or the remote controller, one of five IF bandwidths is able to be selected. The Microprocessor (A8) provides the control information necessary to enable the selected filter bandwidth. From the IF Filter Selector, the bandwidth limited 21.4 MHz IF signal is applied to the 3rd Converter (A10). The 3rd Converter amplifies the 2nd IF signal before being split and applied to separate mixers. The two mixers are used to provide the five 3rd Converter frequencies. The "High Frequency" balanced mixer uses the 25.6 MHz and 29.8 MHz frequencies from the 3rd LO Synthesizer to produce the 8.4 MHz and 4.2 MHz center frequencies of 21.2 MHz and 21.275 MHz to produce the 300 kHz, 150 kHz, and 100 kHz center frequencies. Output frequencies from the balanced mixer (U1) are applied to the 4th Converter (A12) and the output

frequencies from the blanced mixer (U4) are applied to the Output/Filter Driver assembly (A13).

The 4th Converter selects one of the two Third Converter frequencies from the "High Frequency" mixer (8.4 MHz/4.2 MHz) to be bandpass filtered before being mixed with the 5 MHz or 10 MHz signal from the Reference Generator (A4) to produce a center frequency or 800 kHz or 1600 kHz. The center frequency is determined by the selected IF bandwidth. Selecting the 2.4 MHz IF bandwidth selects the 8.4 MHz and 2.4 MHz bandpass filters and the 10 MHz frequency to be mixed to produce the 1600 kHz output center frequency. Selecting the 1 MHz IF bandwidth selects the 4.2 MHz and 1 MHz bandpass filters to be mixed with the 5 MHz signal. This produces the 800 kHz output center frequency. These output frequencies are applied to the Output/Filter Driver assembly (A13).

Selecting the 100 kHz, 150 kHz, or 300 kHz IF bandwidth applies the mixer output frequencies from mixer U0 to the Output/Filter Driver assembly (A13). Signals from the 4th Converter are amplified and video filtered before being applied to the rear panel as the BASEBAND OUTPUT.

In addition to providing the BASEBAND OUTPUT, the Output/Filter Driver assembly provides the front panel meter control, Manual, Peak AGC, or Average AGC and AGC time constants from 1 millisecond to 100 milliseconds.

Remote operation of the WJ-9478 Baseband Receiver Element is provided by connecting a suitable controller to the rear panel IEEE-488 Remote Control Input connector (J11). Received remote commands are applied through the Input/Output assembly (A7) to the Microprocessor (A8) and throughout the Baseband Receiver to the assemblies to be controlled.

3.1.1 INPUT FILTER

Received signals between 250 kHz and 15 MHz, with an amplitude between -50 dBm and -5 dBm, present at rear panel connector A2J1 are low pass filtered before being applied to the Input Converter. Signals present at connector A2J1 are low pass filtered through a multi-pole LC filter. This low pass filter has a roll-off frequency of approximately 22 MHz, allowing frequencies within the passband to be unaffected while attenuating all other frequencies. Low pass filtering provides the means of restricting the input frequency and Baseband Receiver Element LO frequency. After filtering, the input frequency is applied to the Input Converter assembly (A3).

3.1.2 INPUT CONVERTER

The Input Converter provides dual conversion of the received 250 kHz to 15 MHz signal to produce the 21.4 MHz 2nd IF. The first frequency conversion, mixing the received 250 kHz to 15 MHz signal with the 43.06 MHz to 57.81 MHz 1st LO Synthesizer frequency to produce the 43.06 MHz to 57.81 MHz 1st LO Synthesizer frequency to produce the 42.8 MHz 1st LO frequncy. The 1st LO is mixed with the 64.2100 MHz 2nd LO Synthesizer frequency to produce the 21.4 MHz 2nd IF.

Low pass filtered signals from the Input Filter (A2) are applied to Connector J1 of the Input Converter (A3). These signals are applied as one input of double balanced mixer U1. The other input frequency to the mixer is the 43.060 MHz to 57.810 MHz 1st LO frequency from the 1st LO Synthesizer (A5). The mixer output frequency is the 42.81 MHz 1st IF. The 1st IF

frequency is applied to a voltage controlled attenuator before being amplified and bandwidth limited to 2.4 MHz through bandpass filter FL1. Additional LC filtering is provided before the 1st IF signal is amplified an applied to voltage controlled attenuator U6. The gain of attenuators U3 and U6 is used to automatically control the gain of the Input Converter assembly. After amplification, the 42.81 MHz 1st IF signal is applied as one input to double balanced mixer U7. The other input to mixer U7 is the 64.200 MHz to 64.210 MHz 2nd LO frequency. The 2nd LO Synthesizer frequency present at connector J3 and is amplified and filtered before being applied to the mixer. The mixer difference frequency is the 21.4 MHz 2nd IF. The 2nd IF is amplified and filtered before being applied out connector J4 to the IF Selector assembly (A9).

Input Converter assembly A3 provides the 100 Hz tuning resolution of the Baseband Receiver Element. The 1st LO Synthesizer (A5) provides 10 kHz tuning resolution and the 2nd LO Synthesizer (A6) provides 100 Hz tuning resolution.

3.1.3 IF FILTER SELECTOR

The IF Filter Selector provides bandwidth limiting for the 21.4 MHz IF signal by selecting one of four bandpass filters for the associated IF bandwidth selection. Control voltages from the I/O Interface determine which of the four paths is enabled. Both the 2.4 MHz and 1 MHz IF bandwidths share the same filter. Thus the 2.4 MHz bandwidth filter is also the 1 MHz roofing filter. After filtering, the bandwidth limited 21.4 MHz IF signal is directed out of the IF Selector to the 3rd Converter (A10).

2nd IF signals present at connector J1, from the Input Converter (A3) are applied to the bandpass filters. Selection of the bandpass filter is accomplished by control information from the Input/Output Interface (A7). Since the 2.4 MHz bandwidth and the 1 MHz bandwidth share the same filter, only four bandpass filters are contained on the IF Filter Selector assembly. Logic levels from the Microprocessor assembly (A8) are applied through the Input/Output Interface to select the proper signal path through the Input Converter assembly. Selection of the IF bandwidth determines which bandpass filter is enabled. A logic HIGH is used to enable the selected bandpass filter path. Selecting an IF bandwidth enables the 21.4 MHz 2nd IF signal to pass through the selected filter and be amplified before being applied out connector J2 to the Third Converter Assembly (A10).

3.1.4 THIRD CONVERTER

The Third Converter mixes the bandwidth limited 21.4 MHz IF signal with the 3rd LO Synthesizer frequency to produce either a baseband output center frequency of 125 kHz or 200 kHz, for the three narrower IF bandwidths (100 kHz, 150 kHz, or 300 kHz). Or the Third Converter produces an IF output of 8.4 MHz or 4.2 MHz, for the two wider IF bandwidths (1 MHz or 2.4 MHz).

Bandpass limited 21.4 MHz IF signals from the IF Filter Selector are present at connector J1. IF signals are applied to voltage controlled amplifier U1 before being amplified by U2 and filtered. After filtering, the 21.4 MHz IF signal is applied to power splitter U6. One signal path is amplified through U3 before being applied as one input to double balanced mixer U4. The other input frequency to mixer U4 is the 3rd LO Synthesizer frequency at connector J2. 3rd LO Syntheszer frequencies are filtered before being amplified through U8 and U9. After amplification, the 3rd LO frequency is applied to power splitter U10. Splitter U10 provides the 3rd LO frequency to mixer U4 and also to mixer U7. Mixer U4 produces the two baseband frequencies (200 kHz and 125 kHz) used as the center frequency for the 100 kHz, 150 kHz, and

300 kHz IF bandwidths, at connector J3. Mixer U7 provides the converted IF frequencies of 8.4 MHz and 2.4 MHz to connector J5.

3.1.5 FOURTH CONVERTER

Using the Reference Generator as a frequency reference, the Fourth Converter produces the baseband output for the two wider IF bandwidths (2.4 MHz and 1 MHz). This is accomplished by mixing the Third Converter frequency of either 8.4 MHz or 4.2 MHz with the 10 MHz or 5 MHz frequency to produce a baseband center frequency of either 1600 kHz or 800 kHz.

The 8.4 MHz or 4.2 MHz centered IF frequency from the Third Converter, present at connector J2, is amplified by U1 before being applied to a PIN diode switch. Depending on the logic level at connector P1 pins 14 (4.2 MHz SEL) or 15 (8.4 MHz SEL), the signal path through FL1 or FL2 is enabled. A logic HIGH at connector pin 14 selects the 4.2 MHz path through filter FL1 and a logic HIGH at pin 15 selects the 8.4 MHz path through FL2.

After filtering, the selected input signal (8.4 MHz or 4.2 MHz) is amplified before being applied as one input to double balanced mixer U4. The other input frequency to mixer U4 is the 10 MHz applied to connector J3. The 10 MHz signal is applied through EXCLUSIVE OR gates U5A and U5B. The output path from U5B is split. One path is through flip-flop U5A to NAND gate U7A and the other path is to NAND gate U7B. Flip-flop U5A divides the 10 MHz reference signal by two, producing a 5 MHz signal.

The reference signal present at the input of NAND gate U7A or U7B determines the frequency (10 MHz or 5 MHz) applied through transformer T1 to mixer U4. The mixer difference frequency (1600 kHz or 800 kHz) is filtered before being applied out connector J1 to the Output/Filter Driver assembly (A13). These frequencies represent the center frequency of the selected 100 or 2400 kHz IF bandwidth.

3.1.6 OUTPUT/FILTER DRIVER

The Output/Filter Driver assembly provides AGC gain control, time constant selection, video filtering, and final amplification of the baseband signal.

Received signals from the 3rd Converter are applied to connector J2 and signals from the 4th converter are applied to connector J3. Received signals are amplified before being applied through the closed contacts of the selected relay. Logic levels at connector J1 pins 11 to 15, from the Input/Output Interface (A7), are used to select the signal path through relays K1 to K8. A logic HIGH at these pins closes the contacts of the selected relay pair. This allows the signal to pass through the selected low pass filter. Bandwidth #1 (100 kHz) and Bandwidth #2 (150 kHz) are ORed at connector pins 11 and 12. This allows a logic HIGH at either pin to enable the signal path through relays K1 and K5 for either the 100 kHz IF bandwidth or for the 150 kHz IF bandwidth. Selecting the 300 kHz IF bandwidth applies a logic HIGH at pin 13 and closes the contacts of relays K2 and K6. A logic HIGH at pin 15 selects the 2.4 MHz IF bandwidth. **Table 3-1** indicates the logic levels at connector P1 for the selection of the different IF bandwidths.

After filtering, the bandwidth limited signal is split into three paths. One path is through amplifiers U17 and U18 to E1 as the BASEBAND OUTPUT (J1). The second path is through amplifiers U19 and U20 to E2 as the BASEBAND OUTPUT (J2). The third path is to the gain control circuits.

Table 3-1. IF Bandwidth Selection

Connector Pin					IF Bandwidth Selected
11	12	13	14	15	
H	L	L	L	L	100 kHz
L	H	L	L	L	150 kHz
L	L	H	L	L	300 kHz
L	L	L	H	L	1 kHz
L	L	L	L	L	2.4 MHz

Bandwidth limited signals are buffered through Q1 and Q2 before being rectified by diodes CR1 and CR2 and applied to amplifier U1. The output from U1 is split into two paths. One path is to U2, U3, and diodes CR3 and CR4 for the average circuit. The other path is through CR5 to U8A, a U8B, and U4 for the peak circuit. These two circuits provide the automatic gain control (AGC) for the WJ-9478 Baseband Receiver Element. Selection of the gain control mode is determined by the logic level present at pins 16 and 17 of connector J1. A logic HIGH at pin 16 selects the AGC mode and a logic LOW selects the MAN (manual) mode. A logic HIGH at pin 17 selects the AVG (average) mode and a logic LOW selects the PEAK mode. These logic levels are applied to NAND gates U7A to U7D to enable the average or peak circuit, along with the manual or AGC circuit. Logic levels at connector pins 8, 9, and 10 select one of the available five time constants for the average or peak AGC mode. Time constants are selectable from 1, 3, 10, 30, or 100 milliseconds.

Whether the average or peak AGC mode is selected, the AGC output is applied through the loop integrator formed by U5, U9, and their associated components. The loop integrator provides either the peak or AGC voltage to electronic switches U6 and U10. The output from U5 is applied either through U6 to the AGC circuit (composed of U11, U12, and U14) or through U10 to the Microprocessor (U8) and to the Signal Strength Meter.

3.1.7 REFERENCE GENERATOR

The Reference Generator provides the reference frequencies used by the 4th Converter (A12), the 1st LO Synthesizer (A5), the 2nd LO Synthesizer (A6), and the 3rd LO Synthesizer (A10). The Reference Generator uses either an internal 10 MHz source or an external 10 MHz source. Selection of the 10 MHz source is determined by the position of rear panel switch S2. In the EXT (external) position, an external 10 MHz reference source must be connected to J10 (EXT 10 MHz REFERENCE). In the INT (internal) position, reference oscillator U1 provides the 10 MHz reference.

3.1.8 DIGITAL CONTROL CIRCUITS

Microprocessor Control assembly A8 and Input/Output Interface A7 provide digital control for the WJ-9478 Baseband Receiver Element. The Microprocessor Control contains

central processing unit (CPU) U1, read only memory (ROM) U6, programmable read only memory (PROM) U7, frequency display U19, and other devices. These devices are connected by an internal bus. The bus is used to carry address or data information between assemblies or between devices on a single assembly. The CPU controls the exchange of information over the bus. Such as, updating display information, changing the Receiver tuned frequency, or changing an operating parameter.

Using specific addresses, the CPU is able to talk to (write) or listen to (read) a peripheral device or an assembly. This allows for the exchange of information throughout the Receiver. Information from the Microprocessor Control assembly is applied to the Input/Output Interface assembly. Input/Output Interface assembly A7 directs the exchange of data between the Microprocessor and the other assemblies in the Receiver. In addition to directing the internal data flow, it also provides the interface between an external controller connected to J11 (IEEE-488 REMOTE CONTROL INPUT) and the Receiver. Connecting a suitable controller to J11 allows the Receiver to be remotely controlled.

3.1.9 POWER SUPPLY

Line voltages of 115 Vac or 230 Vac are applied through FL1J1 to low pass filter FL1. From FL1, the line voltage is applied through protective fuse F1 to power switch S1. Moving the power toggle switch to the ON position applies the line voltage to the primary of transformer T1. AC voltages at the primary of T1 are coupled to the secondary and fullwave rectified by U9 and U10 to provide unregulated voltages to voltage regulators U2 to U8. These even regulators provide the +15 Vdc, -15 Vdc, and +5 Vdc used by the assemblies throughout the Receiver.

3.2 DETAILED CIRCUIT DESCRIPTION

3.2.1 INPUT FILTER

The incoming baseband frequencies of 250 kHz to 15 MHz which are connected to J2 enter into the Receiver circuits through the Type 381343-1 Input Filter, (A2). The Schematic Drawing of the filter (381306), is **Figure 6-3** and will be found in **Section VI** of this manual. A2 is a low pass filter designed with a 22 MHz roll off frequency. The primary purpose is to reduce high frequency spurs and other interference which is outside of the desired bandpass. The filter is mechanically shielded to help reduce interference. Note: Refer to the proper schematic drawing for the paragraphs which follow. The schematic drawing number is given for each module discussed.

3.2.2 INPUT CONVERTER

The Type 796659-1 Input Converter assembly, **Figure 6-4,** is found in **Section VI** of this manual. The Input Converter assembly provides dual conversion to produce the 42.8 MHz 1st IF and the 2nd IF frequency of 21.4 MHz. The reference designation for the Input Converter is A3.

Low pass filtered signals from the Input Filter assembly (A2) are applied to connector J1 of the Input Converter assembly. The input signals from J1 are applied through a 2 dB impedance matching network (composed of R1 to R3) before being applied as one input to double balanced mixer U1. The other frequency input to mixer U1 is from the 1st LO Synthesizer (A5). 1st LO Synthesizer frequencies, between 43.06 MHz and 57.81 MHz (in 10 kHz steps), are applied to connector J2. The 1st LO frequencies are applied through a 3 dB pad (composed of R1 to R3 before being applied from E2 to power splitter T1. The 42.81 MHz difference mixer frequency is the 1st IF. The 42.81 MHz 1st IF is applied to voltage controlled attenuator U3. Both U3 and U6 are voltage controlled attenuators.

The AGC CONTROL voltage applied through feed through capacitor C4 controls the amount of attenuation of both voltage controlled attenuators. Each voltage controlled attenuator provides between 0 and 30 dB of signal attenuation. As the AGC voltage becomes less positive, the attenuation of U3 and U6 increases. With an AGC voltage approximately +15 Vdc U3 and U6 provide minimum attenuation of the IF signal.

42.81 MHz 1st IF signals applied through voltage controlled attenuator U3 are applied through U4 before being applied through 2.4 MHz bandpass filter FL1. Bandpass filter FL1 has a center frequency of 42.8 MHz. After being bandwidth limited, the 1st IF is applied through variable attenuator AT1 before being applied through a low pass filtered (composed of C17 to C19, L3 and L4) to provide additional attenuation of unwanted signals that FL1 did not eliminate.

After low pass filtering, the 42.81 MHz is amplified through U5 and then applied to the second voltage controlled attenuator U6. From U6, the 1st IF signal is passed through another low pass filtered (composed of L7, C23 and C24) before being applied as one input to double balanced mixer U7. The other input frequency to mixer U7 is the 64.2000 MHz to 64.2100 MHz 2nd LO Synthesizer frequency.

The 2nd LO Synthesizer (A6) produces the 64.2000 MHz to 64.2100 MHz signal present at connector J3. The 2nd LO tunes across this frequency range in 100 Hz, software limited, steps. Synthesized 2nd LO signals from J3 are amplified through U9 before being applied

through a bandpass filter (composed of L13 to L16 and C33 to C37) to eliminate broadband noise. After filtering, the 2nd LO signal is applied through a 3 dB impedance matching network (composed of R19 to R21) before being applied to mixer U7.

Mixer products are amplified by U8 before being applied through a low pass filter (composed of L9 to L11 and C26 to C29) to pass the 21.4 MHz difference frequency. This 21.4 MHz is the 2nd IF and is applied out connector J4 (IF OUT) to the IF Filter Selector (A9).

3.2.3 IF FILTER SELECTOR

The Type 796649-1 IF Filter Selector (A9), contains switching circuits which permit one of four IF filters to be selected. The schematic figure number for the Selector is **Figure 6-12,** and it will be found in **Section VI** of this manual.

The IF Filter Selector circuit may be divided into three basic parts, which are: Input Switching; Attenuator & Filter; and the Output Switching and amplifier circuits. (Refer to the Schematic of this module for the following discussion.)

There are five Microprocessor inputs to the Selector, one for each of the desired filter bandwidths. These are 100 kHz, 150 kHz, 300 kHz, 1 MHz and 2.4 MHz. Selecting one of these frequencies by the Microprocessor causes a positive signal to be present at the input for this frequency, on the card. Note that there is one input on the card for each of these frequencies. In the case of the 1.0 and 2.4 frequency inputs, these are "ORed" together. The reason is that the same IF filter is used (at this point in the receiver), for both frequencies and the selector circuit enables the same filter circuit.

If either 1.0 or 2.4 MHz is selected, diodes CR1 and CR2 OR the signal and the + output causes a positive signal to be present on op amps U1A and U1B. The output of U1A is positive, causing diode CR3 to be forward biased and CR4 to be reversed biased. The result is that the IF input signal is passed through CR3 and into the pad and filter circuits. Diode CR4 being reversed biased presents a high impedance to ground for the IF signal. The IF signal is coupled through C15 to the pad. This pad is factory adjusted for the optimum amount of signal for IF filter, FL1. The output of the filter is coupled through C23 to diode CR11. CR11 is forward biased as the positive U1B amplifier output is connected to resistor R27, allowing CR11 to conduct and forward biasing it. The output of the filter circuit is coupled through C31 to amplifier U3. Notice that all of the filter outputs are connected to the filter side of C31 and thus amplifier U3. Notice also that U1A is used to switch the input switching diodes and U1B is used for switching the output switching diode. The same signal from the Microprocessor is used for each of these amplifiers.

When another bandwidth is selected by the operator (Locally or by Remote Control), the Microprocessor will remove the positive signal from the 1.0 or 2.4 MHz select lines and apply a positive potential on the selected frequency line. When this happens, diodes CR1 and CR2 OR together a negative level, the op amps have a negative input and output. This causes diode CR3 to be reversed biased, preventing the IF frequency from being coupled to filter FL1, causes diode CR4 to be forward biased, essentially bringing the input of the attenuator and filter line down to a low impedance. Also, diode CR11 is then reversed bias, isolating filter FL1 from the output amplifier.

When the 300 kHz bandwidth is selected, the Microprocessor sends a logic HIGH on the '300 kHz line', causing op amps U1C and U1D to amplify, producing a positive voltage at their output. This causes 300 kHz switching diode, CR5 to be forward biased, coupling the input

signal to attenuator AT2 and IF filter, FL2. The output of the op amps also causes diode CR6 to be reverse biased, ungrounding coupling capacitor C17.

At the same time, the op amp output causes the 300 kHz filter output switching diode, CR12 to be forward biased, permitting the filter output to be coupled to coupling capacitor C31 and the output amplifier U3. In each case of IF filter selection, the IF signal will be connected through switching diodes to the selected IF filter and the filter output will be connected to the output amplifier, while the other filters essentially have their input grounded and the outputs will be an open circuit isolated from output amplifier.

Filter circuits for 150 kHz and 100 kHz bandwidths are identical to that just described, and operate in an identical fashion. Note that the IF baseband output is at jack J2.

3.2.4 THIRD CONVERTER ASSEMBLY

The Type 796651-1 Third Converter Assembly (A10), is the next assembly to process the Receiver IF baseband signals. The schematic figure number of the Assembly is **Figure 6-13**, which will be found in **Section VI** of this manual.

The 21.4 MHz IF CF (center frequency) signal enters the Converter at J1 and is coupled through a voltage controlled attenuator (U1), and through capacitor, C2. The attenuation of U1 is controlled by the AGC Control #2 signal. The AGC control voltage is filtered by feedthrough capacitor C4 at its entry to the card at E6. The properly attenuated IF signal leaves the pad at pin 5 and is direct coupled to amplifier U2. The amplified output passes through a three section low pass filter before arriving at signal splitter U3.

The splitter produces two identical IF signals, however one is amplified and the other is not. The reason is, that the pin 6 IF Signal goes to the Fourth Converter, where it receives additional amplification. The IF signal from the splitter output at pin 5 however, (after leaving this assembly), connects directly to the video filter/output amplfier of the receiver. In both cases, the splitter U3 outputs are connected to balanced mixers

In the case of the pin 5 output of the mixer, the signal is amplified (as mentioned previously), and the output of the amplifier connects to the double balanced mixer, U5. The pin 6 output of splitter U3 is connected to the double balanced mixer, U7.

Third LO Synthesizer signals are generated at the 3rd LO Sysnthesizer board, A11. The 3rd LO signal for the two balanced mixers on the Third Converter assembly, enters the assembly at J2. The -15 volt power supply for the LO amplifiers (which follow), employs ferrite beads and bypass capacitors are used to prevent RF on the power supply leads. These signals pass through a three section low pass filter before being capacitor coupled (through C14), to amplifier, U8. The LO signal is amplified by U8 and is then capacitively coupled by C17 to the second amplifier U9, which is a wideband, high gain amplifier, producing the +17 dBm signal needed for the double balance mixer U7. The output of the second amplifier is capacitively coupled through C20 to splitter U6, which is another solid state splitter.

One of the splitter outputs (pin 5), connects to the LO input to balanced mixer U5, and provides 21.2 MHz or 21.275 MHz needed to combine with the IF signal inputs, to produce a center frequency of either 125 kHz (for IF bandwidths of either 100 or 150 kHz) or 200 kHz (for an IF bandwidth of 300 kHz). The output, at pin 6 of splitter U6 is connected to the balanced mixer U7, providing a 25.6 MHz or 29.8 MHz signal (as selected by the operator). Here the 3rd LO frequencies are mixed with the IF signal to produce a 4.2 or 8.4 MHz IF output, which is

connected (at the output of the 3rd Converter assembly), to the Fourth Converter assembly. This output will be used for the 1 MHz and 2.4 MHz bandwidth filters, as selected.

3.2.4.1 24 Volt Power Supply

While +24 is not needed by circuitry in the 3rd Converter Assembly, the assembly contains the circuitry for this power supply. Dual op amp (U10), is used to produce this voltage. One-half of the device (U10-A), is connected as an RC oscillator, with the output amplified by the other half of the device (U10-B). The output is connected to a voltage doubler, consisting of C25, CR1, CR2 and input filter C26. Using this circuit, the original -15 volt input is converted to AC, rectified and an unregulated +24 volts produced. The +24 volt output leaves the printed circuit card at E9, passes through a feed-through capacitor C6, before leaving the 3rd Converter Assembly. The +24 volts is required by the Third LO Synthesizer, A11.

3.2.5 FOURTH CONVERTER ASSEMBLY

The Type 796652-1 Fourth Converter assembly (A12) is the next assembly to process the baseband signals. The figure number for the Fourth Converter is **Figure 6-15**, which is found in **Section VI** of this manual.

The 8.4 MHz or 4.2 MHz input signal, from the Third Converter (A10) is present at connector J2 is capacitively coupled to amplifier U1. After amplification, the signal from U1 is capacitively coupled to two pairs of diode switches. Diodes CR1, CR2, and CR5 form the switch for the 4.2 MHz signal and diodes CR3, CR4, and CR6 form the switch for the 8.4 MHz signal.

The logic level at connector pin 14 (4.2 MHz SEL) and pin 15 (8.4 MHz SEL) enables the signal path through one of the two switches. With a logic HIGH present at either select line (pin 14 or pin 15) the associated signal path is enabled.

Selection of the 4.2 MHz path is accomplished when the Input/Output Interface assembly (A7) applies a logic High at connector pin 14. The High at pin 14 is applied to the non-inverting inputs of U2A and U2B. The positive output from U2A forward biases CR1 and the positive output from U2B forward biases CR5. With these two diodes forward biased, the signal path is through CR1, attenuator AT1, and through the 1 MHz bandpass filter (FL1). From FL1, the signal is applied through a 3 dB attenuator network (composed of R6 to R8), through CR5, and is capacitively coupled to the input of amplifier U3. This allows the 4.2 MHz center frequency signal, from connector J2, to be applied through the 4.2 MHz path and applied to the input of amplifier U3.

The unselected bandwidth line (pin 15) is forced LOW. This LOW reverse biases CR2, CR3 , and CR6 and also forward biases CR4. Under this condition, any signal is prevented from passing through the 8.4 MHz signal path and any signal applied to this path is shunted through CR4.

Selecting the 2.4 MHz IF bandwidth (BW#5) applies a HIGH to connector pin 15. This HIGH forward biases diodes CR3 and CR6, allowing the 8.4 MHz center frequency signal, at connector J2, to be applied through AT2 and the 2.4 MHz bandpass filter (FL2) and a 3 dB attenuator network (composed of R10 to R12) before being directed through CR6 and capacitively coupled to amplifier U3.

The output signal from amplifier U3 is applied through a low pass filter (composed of L3, C19, and C20) before being applied as one input frequency to double balanced mixer U4. The other input frequency to mixer U4 is either 5 MHz or 10 MHz, as determined by the selected IF bandwidth.

A 10 MHz signal, from the Reference Generator (A4), is present at connector J3. This reference signal is applied through EXCLUSIVE OR gates U5A and U5B. These gates are used to amplify and square the reference signal before it is applied out U5B. The squared 10 MHz signal from U5B is split into two paths. One path is through flip-flop U6A to NAND gate U7A and the other path is directly to NAND gate U7B. The 10 MHz signal applied to flip-flop U6A is divided by two and applied to NAND gate U7A as a 5 MHz signal.

Depending on the selected IF bandwidth, an accompanying logic HIGH or LOW is applied to the other input of NAND gates U7A and U7B. A logic HIGH is required at the other input of the NAND gate to produce an output. A logic LOW prohibits the NAND gate from producing an output signal. Selecting IF BW#4 ((4.2 MHz SEL) applies a logic HIGH and NAND gate U7A. Selecting IF BW#5 (8.4 MHz SEL) applies a logic HIGH to NAND gate U7B.

With the NAND gate select input HIGH, the associated 5 MHz or 10 MHz reference signal is applied to NAND gate U7C. NAND gate U7C is used to select either the 5 MHz signal (for BW#4) or the 10 MHz signal (for BW#5). This is accomplished because the unselected NAND output is held at a logic HIGH. With one input of U7C HIGH, the reference signal frequency, from the selected NAND gate, is present at the output of NAND gate U7C.

The 5 MHz or 10 MHz output frequency from U7C is applied to EXCLUSIVE OR gates U5C and U5D. These two gates operate as a phase splitter, providing the push-pull drive for transistors Q1 and Q2. Transistors Q1 and Q2 operate as a push-pull amplifier. The output from these amplifiers is applied through transformer T1 and applied to mixer U4 at a level of approximately +17 dBm.

Mixer U4 combines the selected IF center frequency (8.4 MHz or 2.4 MHz) with the associated 10 MHz or 5 MHz to produce difference frequencies of 1600 kHz or 800 kHz. The difference center frequency is passed through a low pass filter (composed of L4, C21 and C22) before being applied out connector J1 as the BASEBAND OUTPUT. The baseband signal is applied from J1 to the Output/Filter Driver assembly (A13).

3.2.6 OUTPUT/FILTER DRIVER

The Type 481097-1 Output/Filter Driver Assembly (Reference Designator A13), will be discussed next. Refer to the Assembly schematic, **Figure 6-16** in **Section VI.** (Note that the Assembly will be referred to in the discussion as the "OFDA".)

The Output/Filter Driver board (OFDA), has two IF signal inputs. One is the 125/200 kHz IF signal from the 3rd Converter (A10), which enters the board at J2. The other input is the 800/1600 kHz IF signal from the 4th Converter board described in the previous paragraphs, which enters the board at J3. The output from the two converters are handled in two separate channels in the OFDA.

3.2.6.1 Third Converter IF Baseband Signals

The IF signal at J2 (either 125 kHz or 200 kHz), is connected to a high pass pi filter before being amplified by op amp U15. The gain may be set by potentiometer R82. (See Troubleshooting/Alignment **Section IV** of this manual.) The output of U15 is connected to inputs of relays K1 and K2. The relays are used to select the proper video filter for the bandwidth selected, either 100 kHz, 150 kHz or 300 kHz. This relay selection is made by the same Processor address selection logic which selects the desired bandwidth.

If the bandwidth selected is 100 kHz, then pin 11 of J1 (schematic 580743 sheet 1, for the OFDA), will be "HIGH". This will cause the gate of both Q3 and Q4 to turn "ON", and relays K1 and K5 will be energized, connecting the IF signal through K1, through the video filter which follows K1, and through output relay K5. Note that all other relays are "OPEN" when K1 and K5 are "CLOSED". Only one set of relays can be closed at any given time. The IF output from relay K5 is connected to the common point of all of the output relays, K5, K6, K7 and K8. (This part of the circuitry will be discussed later.)

When the 300 kHz bandwidth IF signal is selected (BW3), the IF signal entering the card at J2 is connected through K2. This is because the selection of BW3 causes the gate of Q5 and Q6 to be "HIGH", because pin 13 of J1 is made "HIGH" by the logic levels which select BW3. This causes both Q5 and Q6 to conduct and K2 and K6 "CLOSE", with the result that the 300 kHz bandwidth IF signal passes through K2, through the proper video filter for the bandwidth, and through K6 to the common relay output point.

3.2.6.2 Fourth Converter IF Baseband Signals

When either the 800 kHz IF signal (1 MHz bandwidth-BW4), or the 1.6 MHz (2.4 MHz bandwidth-BW5) IF signal is selected, the selected IF signal appears at J3. These IF signals come from the Fourth Converter (A12). The IF signal is amplified by op amp U16. Potentiometer R88 is used to set the proper amplification level for U16. (See **Section IV** of this manual for Troubleshooting/Alignment procedures.) The output of U18 is connected to one side of relays K3 and K4. Which relay will be closed depends upon which bandwidth has been selected.

When the 1 MHz bandwidth has been selected (BW4), the Processor sends a logic "HIGH" to pin 14 of J1, causing Q7 and Q8 to amplify, closing relays K3 and K7. Therefore the incoming 1 MHz bandwidth IF signal will be connected through K3, through the proper video filter for the bandwidth, and through K7 to the output point of the relays. Notice that a pad (AT1), is used at the end of the video filter.

When the 2.4 MHz bandwidth is selected (BW5), pin 15 of J1 is made "HIGH" and Q9 and Q10 conduct, closing relays K4 and K8. This causes the IF signal to pass through K4, then through the video bandwidth filter, and through relay K8 to the relay output common point. Notice that pins 11, 12, 13, 14 and 15 are all inputs to the gates of transistor/relays. All of the inputs will be LOW at any given time, except for the one which matches the selected bandwidth. In this way, the proper video filter is automatically selected, by the same software which selects the bandwidth.

The output from the four relays K5, K6, K7 and K8, as previously mentioned, have a common connection. From this common point, the signal from the closed relay is connected to three different places. Two of the places are op amps, U17 and U19. Each are the first transistor of identical cascaded amplifiers, each used to develop two separate output signals. U17

and U18 develop the proper signal level for OUTPUT 1 (at E1), and U19 and U20 develop the proper signal level for OUTPUT 2, (at E2).

3.2.6.3 AGC Circuitry

The other connection from the relay common point is connected to the AGC circuits. (See sheet 2 of **Figure 6-16.**) The video signal from the video filter first enters a buffer comprised of Q1 and Q2, arranged in a direct-coupled amplifier configuration. The signal is then rectified by CR1 and CR2 and connected to a precision rectifier circuit composed of U1, CR3 through CR5 and the associated parts. The output of the op amp (U1) is connected to a pulse averaging op amp, U2, connected in an inverting configuration and also to U8A, which will be discussed later. U2, U3, U5 and U9 make up the average AGC circuitry.

The output of U2 is connected to pin 3 of multiplexer/demultiplexer U3. In this configuration, U3 is used as a demultiplexer in a time constant select circuit, and pin 3, is the input of the demultiplexer. Five time constants are provided, 1, 3, 10, 30 and 100 milliseconds. Selection of time constant is accomplished from the front panel of the unit, or by remote controller, over the IEEE-488 bus.

The time constant to be selected is determined at U3, by the binary number received at the AGC board (A13), at pins 8, 9, 10 and pins 16 and 17 of connector J1. Signals labeled AGC0, AGC1, and AGC2 (pins 8, 9 and 10 respectively), are the binary select lines, where AGC0 is the least significant number and AGC2 the most significant. Binary 000 on these lines will select the 1 millisecond AGC time constant, at output "0", pin 15 of U3. Binary 001 selects output "1" at pin 14, 010 selects output "2", pin 13, 011 selects output "3", and binary 100 selects the 100 millisecond time constant at output "4" of U13, pin 1. Each of the time- constant circuits are adjustable by a potentiometer. The adjustments are addressed in **Section IV**, Troubleshooting and Alignment. Note that pin 7 of the demultiplexer is an inhibit input. This input will be discussed shortly.

As mentioned earlier, the output of U1 also connects to U8A, which operates as a peak level AGC op amp stage. The peak level may be adjusted by potentiometer R18. The output of U8A is connected to a peak meter op amp stage U8B, discussed shortly. It is also connected to pin 3 (input), of U4, which is connected to a multiplexer/demultiplexer, connected in a demultiplexer configuration (through resistor R33).

U4 operates in the same manner as U3, demultiplexing the input in such a way that the binary number on the AGC0, AGC1 and AGC2 inputs to U3, select the proper time constant circuit as selected at the front panel (or remotely over the IEEE-488 bus). Note that pin 6 of U4 (and also pin 6 of demultiplexer U3) is the INH (INHIBIT) signal input. In the case of U4, there will be an inhibit signal (HIGH) present whenever "AVERAGE AGC" has been selected. The input will be LOW when "PEAK AGC" has been selected. This HIGH or LOW is determined by the logic circuit which uses the AVG/PEAK* (J1 pin 17) and MAN*/AGC (J1 pin 16) signals.

This logic circuit is arranged so that a logic HIGH (AGC) is present at pin 16 of J1 in order for U7B or U7C to have a logic LOW output. The one which will be LOW, of course, depends on whether pin 17 of J1 has a HIGH (AVG), or a LOW (Peak*) signal present at U7B and C inputs. A HIGH on pin 17 will produce a LOW at the output of U7D, causing the output of U7C to be HIGH, thus the output of demultiplexer U4 will be inhibited, while demultiplexer U3 will not be inhibited. U3 is operational because the input to U7B is HIGH (AVG), making the INH pin 6 of U3 HIGH. Obviously then, demultiplexer U3 will select the time-constant when AVG AGC (average AGC) has been selected at the front panel and demultiplexer U4 will select the time

constant when PEAK AGC has been selected at the front panel. (The time constants for peak and average AGC are different, thus the two different demultiplexers.)

One additional logic gate is provided for the AVG/PEAK*, MAN/AGC* signals. That is U7A. When a HIGH (AGC) is present at J1 pin 16, a HIGH will be present at both inputs to U7A and the output will be a logic LOW, not a Manual signal. At the same time the inputs at U7B and U7C are also high. As mentioned earlier, depending on whether PEAK or AVG AGC has been selected, one or the other will have a HIGH present at its input and the output will select either U3 or U4. Notice that a HIGH on either input pin 16 of J1 (AGC) or a HIGH output from U7A (MAN), (from a LOW at pin 16 of J1), causes electronic switches U6 and U10 to switch. (This is discussed later.)

Note that the output of the two demultiplexers just discussed are connected together at pin 2 (negative input) of op amp U5. U5 and it's associated circuitry form a loop integrator circuit. U9 is a voltage reference circuit which operates with U5. Resistor R70 is used to adjust the output level of the circuit at pin 6 of U5, The output of U5 provides the AGC input (either PEAK or AVG), to electronic switch, U6 (at pin 4). A MAN gain voltage from the gain control digital-to-analog converter, provides the other input to switch U6, (at pin 9). Switching will be discussed shortly.

The output of U8A (peak level op amp) is also connected to the input of U8B, as mentioned earlier. U8B is used to provide the peak AGC voltages for the Signal Strength Meter. Resistor R22 provides "zero set" for the meter and full scale adjustment is provided by resistor R20. Notice that the logic LOW signal output of U8B is connected to one of the inputs of electronic switch U10 (pin 9).

Switches U6 and U10 are energized by the MAN or AGC signals from the logic circuit, as mentioned earlier. Switch U10 is used to provide either the peak AGC voltage to the meter if AGC has been selected, or the voltage from the analog-to-digital converter if MAN has been selected. A HIGH at pin 1 of U10 (from AGC being selected), will connect the output of U8B to the meter circuitry. A HIGH at pin 2 of U10 (from MAN being selected) will connect the input at pin 18 of J1 to be connected to -15V through U10. Also, the same two signals (MAN or AGC), will also cause switch U6 to connect either the loop integrator output or the manual gain control voltage to R55 and the rest of the AGC control circuitry.

Therefore, either the AGC voltage or the manual gain control voltage will be connected to R55, which is the AGC gain control, and on to op amp U11A. This circuitry is basically an AGC shaper. Part of this circuit is composed of a threshold circuit made up of R58, C14, regulator U13 and the AGC threshold adjustment potentiometer, R62. The output of the shaper is connected to buffer U11B and U12.

The output of U12 is the AGC CTL No. 2 output (AGC control output number 2), connected to pin 7 of J1. The output of U12 is also connected to op amps U14A and B, which are connected primarily to provide isolation buffering for a second AGC output, called AGC CTL No. 1 (AGC control output number 1), connected to pin 6 of J1. Various stages of the Baseband Receiver are controlled by AGC CTL 1 or AGC CTL No. 2 voltages. These are illustrated in the Receiver Block Diagram, **Figure 3-1.**

3.2.7 DIGITAL CONTROL SECTION

Control of the demodulator is provided by the digital section, through the Microprocessor Control assembly (A8). The microprocessor module provides program, memory,

timing and control necessary for the demodulator to perform any legitimate task, either locally or through a remote controller. The Microprocessor Control Interface transfers, correlates and interprets all data received through the I/O Interface (A7), except for the keyboard and frequency display, which the Microprocessor handles directly. This includes data to and from the IEEE-488 bus. The Microprocessor card also contains the battery for the non-volatile memory. The Keypad/Display module is utilized during local operation to either demodulator parameter changes via the keypad, and to verify the current working status of the unit through the front panel display.

3.2.7.1 Display

The Type 796273-6 Display reference designation number is A1, (see **Figure 6-1** in **Section VI**). Data is entered utilizing either the front panel Keypad or the IEEE-488 bus, which is connected to the Microprocessor Control module through the I/O Interface module. Data from the Microprocessor is applied to the Display module, at J4. The data is then applied to two shift and store registers, U7 and U8. Any data overflow is applied to the 3rd shift and store register, U3. Clock pulses are utilized to write the digitally encoded data into the registers. Strobe pulses latch the internal state of the registers to the external circuitry, allowing the unit status to be verified. Data is displayed on the front panel LEDs.

3.2.7.2 I/O Interface

The Type 796282-2 I/O Interface Reference Designator is A7, (Schematic Diagram in **Figure 6-10** in **Section VI**). The Input/Output Interface module transfers information in both directions. It transfers both internal and external data utilized by the unit or by a remote controller. The data transferred represents current unit operating parameters or the parameter to be changed. Invalid keyboard entries cause the error detector circuit, LS1 and associated components, to produce an audible tone.

U1 is an address decoder used to address the data latches (U2 through U9) and supply an enable pulse to the analog-to-digital converter (A/D), U8. These data latches control and update the demodulator parameter data. On the leading edge of the rising clock pulse, data present on the data bus is latched to the Q outputs of the data latches. A high level output from the data latch is considered to be an "ON" state for the function controlled. Input data to the latches are received from the Microprocess Control module, A8. Outputs from the data latches are applied to the Baseband Receiver function controlled.

The A/D converter (U9) drives the dual operational amplifier U10, providing gain control during remote operation. Address selection of the Baseband Receiver is accomplished by opening or closing the 5 section switch contacts of S1. Once the desired address is selected, the address buffer (U11) applies it to the data bus lines. Refer to **Table 2-1** for address selection, in **Section II** of this Manual.

NOTE

An change in the setting of address switch S1 does not affect the IEEE-488 bus address of the Baseband Receiver unless memory is lost. When memory is lost, the microprocessor reads the switch settings for the IEEE-488 address. If memory is not lost, the software address, entered using the front panel, determines the Baseband Receiver address.

IEEE-488 general purpose interface bus (GPIB) listener/talker, U12 and two bus drivers, U12 and U14 form the interface between the IEEE-488 bus (for a remote controller), and the microprocessor, U1, on the Microprocessor module (A8). Address decoders U1 and U15 receive data from the Microprocessor Control module. U15 supplies the clock pulses to the shift and store registers U3, U4 and U7 of Display module A1.

On schematic diagram 580380 the following labeling changes have been made. Refer to the Main Chassis schematic diagram for the proper control function label.

U5 outputs (O4 to O7)

FROM	TO
BW	NOT USED

U6 outputs (O0 to O7)

FMNB	NOT USED
AM	NOT USED
FM	NOT USED
SSB	NOT USED
U/L	NOT USED
FMWB	NOT USED

U7 outputs (O0 to O7)

20	TCx1
21	TCx2
22	TCx3
23	NOT USED
24	NOT USED
BW1	NOT USED
BW2	4th LO ON/OFF
BW3	5 MHz/10 MHz

U8 outputs (O0 to O7)

BW4	BW1
BW5	BW2
BW5	BW3
BW7	BW4
BW8	BW5
BW9	AVG/PEAK

3.2.7.3 Microprocessor Control

The Type 796623-3 Microprocessor Control Assembly is Reference Designation number A8, (Schematic is **Figure 6-11** in **Section VI**). The 8085 microprocessor (U1), is a complete 8 bit central processing unit (CPU). U1 is the actual Microprocessor Control IC. It utilizes an external 4 MHz crystal oscillator (after a divide by two counter), providing the CPU

internal operating frequency of 2 MHz. This frequency is applied to the frequency divider U8 and is used to clock the programmable internal counter U9.

Data present at the input lines of latch U2 is loaded onto the output lines when the address latch enable (ALE) line (A7 pin 30), is at a logic LOW. When the ALE line is a logic HIGH, data on the input lines of U2 are connected to the output lines of U2. Output from U2 controls the data bus for the entire bus cycle. Data present at the inputs of U3 are buffered during the time U3 pin 1 is held HIGH. U3 pin 1 controls the direction of data flow. When pin 1 is held HIGH, data is transferred from the microprocessor address/data bus lines and onto the data bus. When pin 1 is LOW, data from bus driver U3 is applied onto the address/data bus. A (RD) (read control) initiated by the microprocessor, applies a LOW to U3, pin 1.

Multiplexed address/data bus lines of the microprocessor, AD0 through AD7, are applied to the transparent latch, U2 and the transceiver, U3. These two devices couple data and address information between the microprocessor and the peripheral devices accessed via the data bus.

Address decoder U4 receives data from the address bus of the microprocessor, which is used to select the peripheral device that the microprocessor is addressing, by supplying a pulse to enable the device. The component being addressed may be found in **Table 3-2,** when inputs E1 and E2 are LOW.

Table 3-2. Address Selection U4

Inputs			Outputs										Selected
E1	E2	E3	1	2	3	15	14	13	12	10	9	7	
L	L	H	L	L	L	L	H	H	H	H	H	H	SEL0 PROM U7
L	L	H	H	L	L	H	L	H	H	H	H	H	SEL1 ROM U6
L	L	H	L	H	L	H	H	L	H	H	H	H	SEL2 FREQ DSPLY U19
L	L	H	H	H	L	H	H	H	H	H	H	H	SEL3 Prog. Intrv. Count. U9
L	L	H	L	L	H	H	H	H	L	H	H	H	SEL4 A/D Conv. U10
L	L	H	H	L	H	H	H	H	H	L	H	H	SEL5 Address Decoder U7U1
L	L	H	L	H	H	H	H	H	H	H	L	H	SEL6 CLK1 and CLK2
	L	H	H	H	H	H	H	H	H	H	H	L	SEL7 IEEE-488 Bus

NOTE: When either E1 (pin 4) or E2 (pin 5) go high all the outputs of U4 go high.

Octal transparent latch U2 and octal transceivers U3 allow the peripheral devices to be access or controlled by the microprocessor. They also hold the devices in a "OFF" state during power-up and power-down conditions. The "OFF" state is a high impedance (Hi-Z) output state and is produced when a HIGH is applied to their enable inputs.

When the outputs of U2 and U3 are in a 3 state (Hi-Z) condition, they neither load or drive the data bus lines. The enable input is controlled by the HOLD acknowledge (HLDA) line from the microprocessor. When both the ALE line is HIGH and the HLDA line is LOW, the bus drivers apply data and address information onto the bus lines, to the peripheral devices.

The microprocessor has the ability to "Read" or "Write" to devices on the IEEE-488 bus. When the READ (RD) line of the CPU (U1), goes LOW, it will read data from the addressed device. When the WRITE (WR) line goes LOW (and the READ line is HIGH), the CPU will write to the device addressed on the bus.

Microprocessor controlled operations can be interrupted through the initiation of any one of three restart interrupts (RST). The restart interrupts, listed in order or priority are: RST 7.5, RST 6.5, and RST 5.5.

When any of the restart interrupts is activated, it causes an internal restart to automatically initiate. Each restart interrupt originates from a different source. RST 7.5 comes from the programmable interval counter. RST 6.5 is initiated through changes on the IEEE-488 bus. RST 5.5 originates from the front panel.

Once an interrupt restart is received and the proper software routine is completed, the input which caused the interrupt to be initiated must be cleared. RST 7.5 and RST 5.5 are cleared by the program control. RST 5.5 must be cleared by the address decoder, U11 on the I/O module. The digital frequency tuning data is applied to the frequency display driver U19. Numerical control and digit information is applied through the data bus and latched to the display output when WRITE (WR) goes LOW.

Information from the I/O module is applied directly to the data bus lines and through bi-directional bus driver U3. Data is also applied to the I/O card via the data bus lines.

The interrupt section, made up of U11 A & B, U16E, U12 A & B, U15 and U17, initiate a restart interrupt when the tuner encoder is utilized to vary the demodulator tuned frequency.

Random access memory (RAM) IC U6, and the erasable programmable read only memory (EPROM) U17, are utilized, respectively, to store data and contains the microprocessor software.

3.2.7.4 1ST LO Synthesizer

The Type 796453-1 1st Synthesizer is reference designator number A5. Components making up the 1st LO module include the 1st VCO, the 1st LO and the 40 kHz notch filter. These are described in the following paragraphs.

3.2.7.4.1 1st LO VCO

The Type 791629-2 1st LO VCO Reference Designator is A5A1, (**Figure 6-7** in **Section VI**). The 1st LO VCO is tuned via the 8 band selectable input transformer, T1. Applying a negative voltage at C1, C2 or C3, forward biases the accompanying diodes CR1, CR2 and CR3, permitting them to conduct. Voltages applied to CR4 is utilized to fine tune the oscillator frequency. Forward biasing the diodes adds parallel inductance to T1, thus reducing the overall circuit inductance and increasing the frequency of the oscillator, Q1. The oscillator frequency is tunable from 171.24 MHz to 291.24 MHz, in 40 kHz steps. Q2 amplifies the oscillator output and applies it to power splitter R9 and R10. One portion of the oscillator output signal is amplified by Q3 and applied to the synthesizer module prescaler circuit. The other portion of the oscillator output is divided by 4 by U1, producing a frequency range from 42.810 MHz to 57.81 MHz. The output of U1 is amplified by 2 amplifiers Q5 and Q7, then transformer coupled to J2 of the Input Converter, A3. Voltage regulator Q4 provides isolated supply voltages for U1, Q5 and Q7.

3.2.7.4.2 1st LO VCO Band Selection

In the 1st VCO (A5A1), VCO ban select.ion is accomplished via the octal encoder U13 and the associated switching circuitry. Depending on the selected frequency, the binary data is applied to the microprocessor controller, through the I/O module and is applied to the 1st LO synthesizer. The two most significant digits (MSD) data is applied to the octal encoder, U13. Outputs from U13 control the band switching circuitry, CR8-CR10, Q2-Q4, and associated circuitry. Input binary coded decimal (BCD) data applied to U13 is translated to octal at the output. A change in the band select switch occurs at the rate of 4 MHz. **Table 3-3** illustrates the relationship between the tuned frequency at the input and the band selected at time output.

Table 3-3. Band Selection Table

Front Panel Display Freq.	U13 Inputs					U13 Outputs			Selector Volt			
	A	B	C	D	E	Y2	Y3	Y4	2^2	2^1	2^0	Band
0 KHz - 3.099 MHz	L	L	L	L	L	L	L	L	+15	+15	+15	0
3.100 - 7.099 MHz	L	L	L	H	L	L	L	H	+15	+15	-15	1
7.100 - 11.999 MHz	L	L	H	L	L	L	H	L	+15	-15	+15	2
11.100 - 15.099 MHz	L	H	L	L	H	L	H	H	+15	-15	-15	3

NOTE

Only 7 bands are presently used. The eighth band is not utilized, and is not allowed by software.

3.2.7.4.3 40 kHz Notch Filter

Between the VCO and the synthesizer module is a 40 kHz notch filter and a voltage regulator. The purpose of the notch filter is to filter out any 40 kHz which might be present on the tuning voltage line. The purpose of the regulator is to bias the band switching transistors and produce the desired reference frequencies of 1, 10 and 100 kHz.

3.2.7.4.4 1st LO Synthesizer

The Type 796453-1 1st LO Synthesizer reference designator number is A5A2, (Schematic Diagram is **Figure 6-8** in **Section VI**). In addition to being applied to U13, the two MSD data is also applied to U10 and U11. U10 is utilized for the 1 MHz BCD data and U11 is utilized for the 10 MHz BCD data. U10 and U11, along with part of U9, make up the programmable counter. With the D input of U11 hard wired logic HIGH, the programmable counter is preset to 8000.

The two least significant digits of binary coded decimal data is applied to the digital code converter U4 and U9 of the swallow counter.

U4 is programmable read only memory (PROM) that translates the input BCD to a different output code. Refer to **Table 3-4** for code conversion of U4.

Table 3-4. U4 Code Conversion

Inputs				Outputs			
D	C	B	A	Y4	Y3	Y2	Y1
L	L	L	L	L	L	L	L
L	L	L	H	L	H	L	L
L	L	H	L	L	L	H	H
L	L	H	H	L	L	H	L
L	H	L	L	L	L	L	H
L	H	L	H	H	L	L	L
L	H	H	L	H	H	L	L
L	H	H	H	H	L	H	H
H	L	L	L	H	L	H	L
H	L	L	H	H	L	L	H

Note: Outputs from U4 preset the swallow counter and programmable counter.

The prescaler (U1 and U2A) combine to form a divide by 50/51 prescaler. Input frequencies to U1 vary between 171.64 and 291.60 MHz from the 1st LO VCO. U1 divides by 51 when E4 is logic LOW and E5 pulses LOW once for every fifth output pulse from U2A.

The 1st LO tuning and frequency sequence begins when binary coded decimal (BCD) data is applied to the programmable counter (U9, U10, and U11), and to the swallow counter (U8 directly and through U4 to U9). U4 presets U9 to the code for the selected frequency. Band selection of the 1st LO VCO is accomplished through U13, utilizing the same BCD data applied to the programmable counter.

With both counters preset and the VCO band selected, the VCO output frequency is applied to the input of the prescaler. For every 51 pulses from the VCO, the prescaler produces an output pulse and decrements the count of both the swallow and the programmable counter. When the swallow counter reaches its terminal count, the terminal count controller (U3) output enable, goes HIGH. The HIGH is connected to U1 and causes the prescaler to divide by 50 until the end of the count cycle. When the programmable counter decrements to its terminal count, it is detected by U3 and the FO output goes HIGH after one more pulse from the prescaler. The HIGH FO pulse is applied to the frequency/phase detector U5, for comparison with the divided down signal from the Reference Generator. When the FO output returns LOW, both counters are reset to their presets and the enable output (DE) goes LOW, allowing the prescaler to divide by 51 again.

The 1 MHz signal from the Reference Generator is split and applied to a divide by 25 section (U15B and U17), a divide by 1000 section (U19 - 20), and to the 3rd LO frequency/phase detector.

After the 1 MHz reference signal is divided down to 40 kHz, via U15B and U17, it is applied to frequency/phase detector U5. U5 compares the divided signal with the 1st LO VCO counter signal. Any differences in frequency and/or phase, produces an error voltage through the charge pump and is applied to the lead/lag filter, U7. Error voltages from U5 amplified by U7 and applied to varicap diode CR4 in the 1st LO VCO to vary the LO frequency. When both signals at the input to U5 are identical, the error voltage is eliminated and the 1st LO is locked on frequency.

3.2.7.5 2nd LO Synthesizer

The Type 796226-1 2nd LO Synthesizer is reference designator number A6, (Schematic Diagram is **Figure 6-9** in **Section VI**). Similar to the 1st and 3rd LO, the 2nd LO utilizes phase-lock-loops and voltage controlled oscillators (VCOs) to ensure frequency stability and accuracy.

The 2nd LO module receives two input signals which are used as the reference frequencies in the frequency/phase detectors for the 1st and 3rd VCOs. The 1 MHz reference signal applied to the 1st VCO frequency/phase detector, is from the Reference Generator (A4). The 10 kHz reference, applied to the 3rd VCO frequency/phase detector, comes from the 1st and 3rd LO Synthesizer.

In order for the 2nd LO output frequency to be accurate and locked on frequency, both the 1st and 3rd VCOs must be locked. 2nd LO output frequencies vary from 64.20001 to 64.21000 MHz, in 10 Hz steps and at an output level of -3 dBm to 0. The 2nd LO output frequency is applied to the Frequency Converter (A3), producing the 21.4 2nd IF signal. The 2nd tuning step size LO is limited to 100 Hz by the WJ-9478 software.

3.2.7.6 1st VCO

The 1st VCO has a resonant frequency of 64 MHz and is applied to a divide by 64 network (U2, U3A and U3B), producing a 1 MHz signal. This 1 MHz frequency is applied to frequency/phase detector U1 and is compared with the 1 MHz reference signal. Any difference in frequency and/or phase produces an error voltage. The error voltage is applied to the varicap diode in the 1st VCO to vary the VCO output until the two inputs to U1 match in frequency and in phase.

3.2.7.7 3rd VCO

The 3rd VCO has a variable frequency from 200 - 210 MHz. A variable (divide by N) frequency divider network changes its divide by ration, depending on the tuned frequency of the demodulator. The divide by N network (U7-U11, U14, and U15), varies its divide by ration to produce a 10 kHz signal at the input of frequency/phase detector U12. This 10 kHz signal is compared with a reference 10 kHz signal from the 1st and 3rd LO Synthesizer module. Any differences between the two input signals in frequency and/or phase, is converted to an error voltage and applied to the 3rd VCO frequency, until the error voltage becomes zero and a lock occurs. The divide by 1000 section of the 3rd VCO circuitry, (U16-U19) produces a 200 to 210 kHz frequency at one input of frequency/phase detector U6.

3.2.7.8 2nd VCO

The 2nd VCO output frequency is the same as the 2nd LO frequency. A sample of the 2nd VCO frequency is applied to mixer U4 to be mixed with the 64 MHz signal from the 1st VCO. The difference of the two mixed frequencies (200 - 210 kHz), is amplified and applied to the other input of U6. If both inputs to the frequency/phase detector U6 match exactly, no error voltage is generated and a lock condition is present. There is no dividing chain in the 2nd VCO loop. Tuning is accomplished by changing the reference frequency.

3.2.7.9 3rd LO Synthesizer

The Type 796655-1 Third LO Synthesizer (A11), schematic will be found in **Section VI** of this manual, **Figure 6-14.**

The 3rd LO is another synthesizer frequency source. It uses: a transmission line VCO, (Q1, Z1, and CR1-CR14); loop amplifier and filter U4; divider chain and phase detector U2; modulus prescaler U5; serial to parallel converter U3; voltage regulator U8 and U9; output amplifier U6; voltage regulator U1 and U7; and logic level converter U10.

U2 contains the programmable divider chain and phase detector. Tuning information enters the divider in serial format at pin 10, when clocked in by clock pulses on pin 9. After that data word is clocked in, a short pulse (8 msec) at pin 11 latches the data internally.

The 1 MHz reference and the RF from the prescaler (U5), are both divided internally and compared in the phase detector. The phase/frequency error at pins 15 and 16. Pin 12 is a logic level signal to control the division rate of the prescaler, where LOW = divide by 81 and HIGH = divide by 80. The Modulus output is given in **Table 3-5.**

Table 3-5. Modulus Output at U2-Pin 12 For Each Bandwidth

BW Frequency	Lower	High
2.4 MHz	Low = 6 mSEC	High = 34 mSEC
1.0 MHz	Low = 13 mSEC	High = 27 mSEC
300 kHz	(Remains High)	
150 kHz	Low = 11.5 mSEC	High = 28.5 mSEC
100 kHz	Low = 11.5 mSEC	High = 28.5 mSEC

U4 and associated circuitry amplifies and filters the pulses coming from U2, pins 15 and 16, to produce the DC tuning voltage. L2 and C66 resonate at 25 kHz to remove the 25 kHz generated by the dividers in U2. R7 is adjusted to reduce the 25 kHz sidebands in the LO output. Additional filtering is provided by R13 and C20.

Q1, Z1, CR1 through CR14 ad aessociated circuitry form a high frequency transmission line oscillator, (TLO). The transmission line Z1 1/4 wavelength, therefore the capacitance at the end of the line, away from Q1, appears as an inductance to Q1, providing the required inductance for the TL oscillator. (The frequencies/bandwidth/LO out frequencies, are given in **Table 3-6.**)

Table 3-6. Transmission Line Oscillator Frequencies per BW/LO Output

BW Frequency	VCO Frequency	Divide By	LO Output Frequency
2.4 MHz	238.4 MHz	8	29.800 MHz
1.0 MHz	204.8 MHz	8	25.600 MHz
300 kHz	212.0 MHz	10	21.200 MHz
150 kHz	212.750 MHz	10	21.275 MHz
100 kHz	212.750 MHz	10	21.275 MHz

The voltage at Pin 2 of U10 is always LOW, forcing the output of U10 to be a HIGH, which turns on CR13. Therefore CR14 and CR15 are added to the tuned circuit, which lowers the free running frequency. U8 is turned on by a LOW at Pin 8 which occurs when the 100, 150 or 300 kHz bandwidth is selected. Divider U8 divides by 10. U9 is turned on by a LOW at pin 12 which occurs whenever the 1 MHz or 2.4 MHz bandwidth is selected. Note that U9 divides by 8.

U6 is a 50 ohm hybrid amplifier with approximately 14 dB gain. The output level should be -6 dBm, plus or minus 1 dB. U7 provides 10.7 volts DC for Q1. U1 supplies +5 vdc for U2, U3, and U5.

3.2.7.10 Reference Generator

The Type 796628-1 Reference Generator (A4), schematic (**Figure 6-5**), will be found in **Section VI** of this manual, diagram number 481001.

The Reference Generator provides the reference frequencies used by the 4th Converter (A12), the 1st LO Synthesizer (A5), the 2nd LO Synthesizer (A6), and the 3rd LO Synthesizer (A10). The Reference Generator uses either an internal 10 MHz source or an external source. Selection of the 10 MHz source is determined by the position of rear panel switch S2. In the EXT (external) position, an external 10 MHz reference source must be connected to J10 (EXT 10 MHZ REFERENCE). In the INT (internal) position, reference oscillator U1 provides the 10 MHz reference.

The 10 MHz external reference signal is coupled through C14 and T1 to line receiver U3. Transformer T1 is a step-up transformer with an impedance ratio of 1:9. The line receiver receives a logic HIGH from the +5 volt supply at pin 6 and the reference signal at pin 5. The output of the line receiver (pin 7), is dependent on internal switching of the line receiver by the potential at pin 2 of U3. This potential is determined by selection of internal or external reference.

The internal external reference generator switch is mounted on the rear panel of the Receiver. When in the External position, +5 volts is applied to the Reference Generator card at pin 7 of P/O P1. The logic HIGH is filtered by C1 to remove any noise or other AC potentials which might be on the DC line. The HIGH is connected to the pin 2 connection of the line receiver, U3. This control signal switches the line receiver off and any input from an external generator will not pass through the line receiver. The output at pin 7 of U3 will be a logic HIGH, as long as the Internal/External switch on the rear panel is in the "INTERNAL" position.

The HIGH at pin 7 of U3 is connected to pin 4 of NAND Gate U2B. Notice that the +5 volt line connected to pin 2 of U3 is also connected to pins 12 and 13 of U2D, causing it to act as an inverter, changing the HIGH to a LOW at the output, pin 11. This LOW is connected to pin 5 of U2B, causing its output to go HIGH. The HIGH from U2B is connected to input pin 10 of U2C. As will be shown shortly, this in effect turns U2C "ON".

The incoming +5 volt line mentioned before, is also connected to pin 1 of the reference oscillator, U1. This provides the potential necessary for the device. The output from it is at pin 3, which is connected to one of the inputs of NAND gate U2A. The other input, pin 2, is at a logic HIGH (from the +5 line), permitting the 10 MHz signal to pass through U2A and over to one input (pin 9) of U2C. As mentioned previously, pin 10 of U2C has a logic HIGH on it, switching the U2C "ON" and allowing the signal to pass through U2C.

The output at pin 8 of U2C is split into two paths. One is to inverter U4A, then through a bandpass filter to C7, which capacitively couples the reference oscillator signal to amplifier U5. The output of the amplifier (pin 2), is then capacitively coupled to pin 25 of P1.

If the external reference is selected by the Internal/External switch on the rear panel, there is no +5 volts at pin 7 of P1 and the Internal 10 MHz oscillator does not have voltage to operate. In addition, a connection down to the line receivers (pin 2) is also at logic LOW,

enabling the Line Receivers and permitting the external reference signal to be connected to U2B. The other input to U2B is HIGH (because the input to U2D is LOW), causing its output to be HIGH, allowing the external reference signal to pass through U2B and on to pin 10 input of U2C.

The other input of U2C is at a logic HIGH due to U2A being "OFF". Thus the "EXTERNAL" reference source is passed through the card to inverter U4A, through the bandpass filter to U5, amplified and connected to the pin 25 output of the card.

As mentioned previously, the output at pin 8 (of U2C), either Internal or External generator signals), is split into two paths. The other path is through two inverters, U4-B and U4C, and then to U6A, which is connected as a divided by 10 counter. Only the QA output of U6A is used. The 1 MHz output is coupled through three (3) individual inverters, U7B, U7C, and U7D, providing three separate 1 MHz outputs from the card. These are at pins 5, 6 and 10 of the I/O connector P1

SECTION IV

MAINTENANCE

SECTION IV

MAINTENANCE

4.1 GENERAL

The WJ-9478 Baseband Receiver is designed to operate for extended periods of time with a minimum amount of routine maintenance. Cleaning, inspection and performance tests should be performed periodically, following the purchasers routine maintenance schedule.

4.2 CLEANING AND LUBRICATION

Periodic cleaning should be performed to keep the Receiver free from dust, grease and other foreign matter or contaminates. Accumulated dust may be removed from the interior of the unit by using low pressure air to blow the dust away. A better method is to vacuum the dust from the unit, then a soft, clean cloth may be used to do the final cleaning. No lubrication is required, or should be used on the Baseband Receiver.

4.3 INSPECTION FOR DAMAGE OR WEAR

Existing and even potential troubles may often be detected through a thorough visual inspection of the Receiver. A first step approach therefore, in case of a possible operational problem, should be a thorough visual inspection. Mechanical parts, such as pin connections and interconnecting cable connectors should be checked for looseness, excessive wear or other signs of deterioration. Plug-in printed circuit cards and subassemblies should be checked for proper installation and to be sure that the electrical connections of the card are secure. Any electrical component which shows signs of deterioration such as overheating or cracking, should be inspected along with the associated circuitry to verify proper operation.Damages often occur due to an overheating component, which is the result of a less apparent problem in the associated circuit.

4.4 TEST EQUIPMENT REQUIRED

Test equipment such as that listed in **Table 4-1** (or equivalent), is required to perform the troubleshooting, performance testing and alignment instructions given in this section.

Table 4-1. Suggested Test Equipment

Qty	Type	Manufacturer	Description
1	92B	Boonton	RF Voltmeter
1	91-12F	Boonton	RF Probe
1	91-8B	Boonton	50 ohm Adapter
2	8640B	Hewlett-Packard	RF Signal Generator
1	8050	Fluke	Digital Multimeter
1	3585A	Hewlett-Packard	Spectrum Analyzer
1	8568A	Hewlett-Packard	Spectrum Analyzer
1	8012B	Hewlett-Packard	Pulse Generator
1	466A	Tektronix	Storage Scope
1	1953A	Fluke	Frequency Counter
1	9825	Hewlett-Packard	Calculator/Computer
1	465B	Tektronix	Oscilloscope

4.5 TROUBLESHOOTING

A Troubleshooting chart with corrective action is given in **Table 4-2.** Table 4-3 lists the various power supply output potentials, with the permitted variance.

NOTE

Before removing or installing any card, make sure that the power has been turned off.

Table 4-2. WJ-9478 Baseband Receiver Troubleshooting Chart

Symptom	Probable Cause	Corrective Action
Receiver Inoperative	F1-blown	Replace fuse with proper value.
	Line cord defect	Replace line cord.
	Power switch S1	Replace S1.

Table 4-2. WJ-9478 Baseband Receiver Troubleshooting Chart (Continued)

Symptom	Probable Cause	Corrective Action
	Voltage Regulator	Repair defective voltage regulator
	Digital Control	Check Keyboard/Display, Microprocessor, to be sure they are operational. Check seating of cards in slots.
Front Panel Indicators are random when turned on.	Microprocessor Control defect.	Check battery, microprocessor control card.
Front Panel LEDs do NOT light.	Power supply	Check fuse, switch, line cord and power.
Front Panel LEDs are dim, operating marginal-DC volt low.	Power supply	Power line selection switch is in 230V position but unit operating on 114 vac.
+15 and -15 volts operating, but -5 is not operating.	Power supply	One of the transformer windings may be open.
Unit works on 230, but blows fuses on 115 vac.		Use 1 amp fuse for 115, 1/2 amp for 230.
Keyboard inoperative or incorrect.	Keyboard (A1A1)	Check keyboard.
	Microprocessor	Check microprocessor.
	Control (A8)	Check I/O interface (A7)
	I/O interface	Check LOCAL/REM sw Check J4 on front panel Check orientation of J1, J2 and J3
Band display and operation	Microprocessor	Check ROM, card.
Manual tuning count error	Encoder assembly (A1U1) Display (A1)	Check encoder output and verify numerical sequence.
Incorrect Tuning	Reference Gen. (A4) Synthesizer	Check Ref. Gen. Freq. Check LO's/locked condition.
Tunes in 10, 100, 100 kHz steps but not 1 and 100 Hz		Check 2nd LO and I/O.

Table 4-2. WJ-9478 Baseband Receiver Troubleshooting Chart (Continued)

Symptom	Probable Cause	Corrective Action
Tunes in 1 kHz and 100 Hz steps but not 10, 100, 1000 kHz.		Check 1st LO and I/O card.
Tuning skips or jumps back in frequency while tuning slowly but the LO's remain locked or repeats same pattern		Check logic levels coming from I/O card to LO, while tuning look for an output latched low or high. Check for short or replace output IC
Tune some frequencies but becomes erratic on others		Check LO tuning voltages and realign if necessary. Check 1st LO for proper band switching.
Some baseband frequencies operate - others do not.		Check 3rd LO.

4.6 PERFORMANCE TEST

A performance test is a good method for determining that the WJ-9478 Baseband Receiver is operating properly. A method of performing this test is outlines in the next paragraphs. If this test is performed as suggested, the Power Supplies, Converters, Filters, LO's, AGC and amplifiers will be determined to be either operating properly or not. If not, the area of abnormality can be relatively determined from the performance test. Test equipment needed for this test is given in **Table 4-3.**

Table 4-3. Equipment Required to Perform Tests

Qty.	Type	Manufacturer	Description
1	95B	Boonton	RF Voltmeter
1	3585A	Hewlett-Packard	Spectrum Analyzer, or
1	8568A	Hewlett-Packard	Spectrum Analyzer
1	8012A	Hewlett-Packard	Pulse Generator
1	1953A	Fluke	Digital Frequency Counter

In the following steps, equipment setups will be shown as required. In any case, connect the equipment as shown or described and adjust it for the parameters given in each step.

4.6.1 POWER SUPPLY

Check the following Power Supply voltages at the Test Points given for the various power supply outputs, as shown in **Table 4-4**, using a digital voltmeter. The voltages should be as indicated, ± 5%. The test points will be found on the Power Supply, located on the Main Chassis of the Receiver. Remove bottom cover to make test points available.

Table 4-4. Power Supply Output Voltages and Test Points

Power Supply Output	Test Point
+15 VDC (A)	E1
+15 VDC (B)	E2
-15 VCD	E3
+5 VDC (A)	E4
+5 VDC (B)	E5
+6 VDC	E7

4.6.2 REFERENCE GENERATOR

1. Disconnect the cable connected to J2 of the third LO Synthesizer, A11 and connect it to the Frequency Meter.

2. Make sure Internal/External switch S2 is in the "INT" position. Wait 20 to 30 minutes after turning everything "ON", for the equipment to stabilize.

3. The frequency read on the Frequency Counter should be 1 MHz. If not,

4. Adjust the frequency of the generator using the "FREQ ADJ" Adjust to 1.00 MHz. The accuracy of making this adjustment this way is good enough to meet specifications.

NOTE

The above step must be done BEFORE any of the following performance tests are performed.

4.6.3 LOCAL OSCILLATOR (LO) SYNTHESIZER TESTS

1. Connect a digital Frequency Counter to either of the Receiver Baseband output jacks, OUTPUT 1 or OUTPUT 2.

2. Adjust the receiver as follows:

   Set Frequency (with keypad) to Zero -
   Select 2.4 MHz BW
   Select AGC mode (Either AVG or PEAK)

3. The center frequency measured with the Digital Frequency Counter. Should be 600 kHz.

4. Select the 1.0 MHz BW.

5. Center frequency measured at the BASEBAND OUTPUT jack should be 800 kHz.

6. Select the 300 kHz BW.

7. Center frequency measured should be 200 kHz.

8. Select the 150 kHz BW.

9. Center frequency measured should be 125 kHz.

10. Select the 100 kHz BW.

11. Center frequency measured should be 200 kHz. The frequencies given in 4.6.3 should be ±10 Hertz.

4.6.4 CONVERTER, AMPLIFIER, LO TEST

1. Connect an R.F. Generator to the WJ-9478 Baseband Receiver at the R.F. input jack, A2J1.

2. Set the Frequency to 10 MHz and output level at -50 dBm.

3. Select ANY BW.

4. Select MAN gain and set GAIN control to "MAX".

5. Connect R.F. dBm meter to OUTPUT 1 at the rear panel of the Baseband Receiver, using a 50 load. Output should read +10dBm.

6. Connect an oscilloscope with 50 ohm load to OUTPUT 2. Should measure 2 volts P-P.

7. Swap oscilloscope and R.F. dBm connections and make sure OUTPUT 1 measures +10 dBm and OUTPUT 2 measures 2 volts P-P.

8. Set the GAIN control to "MIN".

9. Set signal generator gain to -5 dBm.

10. Again check the output at the Receiver OUTPUT jacks 1 and 2, to be sure that the output is still +10 dBm, 2 volts P-P.

11. Select "AGC" and "PEAK" on the Receiver Front Panel.

12. Connect Oscilloscope with 50 ohm load to one of the OUTPUT connectors at the rear panel and connect the RF dBm meter to the other OUTPUT jack.

13. Set the signal generator output level to -50 dBm.

14. Check the Receiver OUTPUT level. It should be +10 dBm, 2 volts P-P into 50 ohms at both OUTPUTs.

15. Set the signal generator output level to -5 dBm.

16. Again check the output level at both OUTPUT jacks at the rear panel and make sure that both are +10 dBm, 2 volts P-P. The outputs should NOT increase more than +1.5 dBm over the range of -50 dBm to -5 dBm.

4.6.5 INPUT/OUTPUT LEVELS

Another very important check on performance is to check the output levels of each of the modules in the signal path. In the following steps the output level will be checked and adjusted if necessary.

4.6.5.1 Input Converter (A3)

To check for the proper output level from the Input Converter, perform the following steps.

1. Connect an RF Signal Generator to the Receiver Input, jack A2J1 and set the Generator frequency to 15 MHz and the output level to -50 dBm.

2. Set the Receiver GAIN control to MAX and tune to 15 MHz.

3. Check to be sure that the AGC voltage at pin 6 of the AGC card, A13 is +10 volts DC.

4. Connect an RF meter to J1 to be sure that the input to the Input Converter is -50 dBm.

5. Disconnect the cable connected to J4 of the Input Converter (A3) and connect a Spectrum Analyzer.

6. Tune the Analyzer to a center frequency of 21.4 MHz and check for a signal level of -36 dBm.

7. Should the output level be other than -36 dBm, adjust AT1 for the proper output.

8. Re-connect the inter-module cable removed in step 5.

4.6.5.2 **21.4 MHz IF Filter Selector (A9)**

To test the output level of the 21.4 MHz IF Filter Selector, perform the following steps.

1. Disconnect the cable connected to output jack J2 of the IF Selector (A9) and connect a Spectrum Analyzer to this output jack. (Keep the generator input to the Baseband Receiver the same as in **Paragraph 4.6.5.1).**

2. Select the 2.4 MHz bandwidth filter on the Baseband Receiver front panel.

3. Set the Analyzer for a center frequency of 21.4 MHz and check for an output of -30 dBm.

4. Select the 1.0 MHz bandwidth filter at the Receiver front panel and check for an output on the Analyzer. The output should still be -30 dBm.

5. Select the 300 kHz bandwidth filter at the Receiver front panel and check for an output on the Analyzer of -36 dBm.

6. Select the 150 kHz bandwidth filter at the Receiver front panel and check to see that the output level remains at -36 dBm.

7. Select the 100 kHz bandwidth filter and again check for an output level at J2 of -36 dBm.

8. Disconnect the Analyzer and re-connect the inter-module cable to J2.

4.6.5.3 **Third Converter (A10)**

Check the output level of the Third Converter by performing the following steps.

1. Before checking the output level of the Converter, disconnect the cable at J2 (coming from the Third LO Synthesizer), and connect the cable (with adapters), to the Spectrum Analyzer and check the level for approximately -6 dBm. Tune the analyzer to

each of the frequencies given in **Table 4.5** and check the level as each bandwidth is selected on the front panel. (The 3rd LO output frequency of course changes with the Bandwidth selected.) Check the output level for -6 dBm, ±1 dB.

Table 4-5. 3rd LO Output Frequencies versus Bandwidth Selected

BW Selected	3rd LO Output Frequency
2.4 MHz	29.800 MHz
1.0 MHz	25.600 MHz
300 kHz	21.200 MHz
150 kHz	21.275 MHz
100 kHz	21.275 MHz

2. Re-connect the cable removed from J2.

3. Remove the inter-module cable connected to J4 of the Third Converter and connect the Spectrum Analyzer to J4.

4. Leave the generator connections and settings the same as the last two previous steps.

5. This output jack is used for both the 8.4 MHz and 4.2 MHz center frequencies, bandwidth filter 2.4 MHz and 1 MHz respectively. Therefore, output level must be checked for both bandwidth filters.

6. Select the 2.4 MHz bandwidth filter at the front panel of the Baseband Receiver. Set the Analyzer for a center frequency of 8.4 MHz and check for an output level at J4 of -26 dBm, ±1 dB.

7. Select the 1.0 MHz bandwidth filter at the Receiver front panel and set the Analyzer for a center frequency of 4.2 MHz and check the output level. The level should be identical with step 6, at -26 dBm at J4, ±1 dB.

8. Re-connect the cable removed from J4 and disconnect the cable at J3 of the Third Converter. Connect the Spectrum Analyzer input to J3. This jack is the 300, 150 and 100 kHz outputs from the Third Converter and each of the frequencies should be checked for proper output level.

9. Select the 300 kHz bandwidth filter at the Receiver front panel and adjust the Analyzer for a center frequency of 200 kHz.

10. Check the Analyzer for a signal level of -21 dBm at J3.

11. Test equipment level is the same as before, but select the 100 kHz bandwidth filter and check the output level at J3. The Analyzer should be the same -21 dBm, ±1 dB, as before.

12. Select the 150 kHz bandwidth filter at the Receiver front panel and set the Analyzer for a center frequency of 125 kHz. Check for an output level at J3 of -21 dBm, ±1 dB.

13. Disconnect the Spectrum Analyzer from J3 and re-connect the cable removed earlier from J3.

4.6.5.4 **Fourth Converter (A12)**

Check the output level of the Fourth Converter by performing the following steps.

1. Disconnect the inter-module cable connected to J2 of the Output Amplifier (A13) and connect the end of the cable to the Spectrum Analyzer.

2. Receiver input frequency and level from the generator as before.

3. Select the 2.4 MHz bandwidth filter at the Receiver front panel and set the Analyzer to a center frequency of 1.6 MHz.

4. Check for an output level at J1 of -11 dBm, ±0.5 dB.

5. Select the 1.0 bandwidth filter at the Receiver front panel and set the Analyzer to a center frequency of 800 kHz.

6. Check for an output level at J1 of -11 dBm, ±0.5 dB.

7. Disconnect the Spectrum Analyzer, reconnect the inter-module cable removed from J1 earlier.

4.6.5.5 **Discussion**

The test of 4.6.1 through 4.6.4 basically check the entire performance of the Baseband Receiver. In the case of the tests made in 4.6.1, all of the power supplies, regulators and associated circuitry were checked, as the regulated voltages of the various supplies would not be correct, unless operation of these parameters were correct.

In the test performed in 4.6.2, the Reference Generator was checked for operation and for proper frequency. This was a requirement (after the power supply check), for all of the tests which were to be performed later, as the Reference generator is used by the LO's of the Receiver and the proper operation and correct operating frequency is of the upmost importance.

The tests made in 4.6.3 check the Receiver LO's. It is their frequency beating against each other which is used to produce the various LO frequencies used in the Receiver

Measuring Center. The frequency at the output of the Receiver for each of the available bandwidths of the Receiver, are a direct result of the proper operation and frequency of the Receiver LO's.

Tests run in 4.6.4 are a check on the operation of most of the Receiver circuits. The LO's are checked in actual operation, because they must be combined in the various mixers to produce the proper IF frequencies and to produce the proper center frequency (for the BW selected), at the output. The various amplifiers and attenuators used in the Receiver are also checked in this test, as the output level was checked at the OUTPUT of the Receiver, with an input level of -50 dBm and at -5 dBm at the Receiver input. Had the amplifiers in the Receiver been other than fully operational, an output of +10 dBm could not be obtained.

Of course AGC can compensate for the output level of a module so that the output of the Receiver remains at the proper +10 dBm. For that reason the individual module output levels were tested in **paragraphs 4.6.5.**

The amplifiers were further checked in the tests of 4.6.4. Here the AGC circuits were checked also. Both the Peak and the Average AGC circuits (many circuits which are different), were checked. Again, if the amplifiers or AGC had not been operating properly, an output of +10 dBm, with input from -50 dBm to -5 dBm, could not have been obtained. If the amplifiers were working properly, but the AGC circuits were not operating correctly, the output of the Receiver likely would not be +10 dBm over the operating range.

4.7 ALIGNMENT

Alignment procedures are not to be considered to be a routine procedure, but rather a very infrequent servicing task. Under normal conditions, alignment will not be necessary. However, when performance of the receiver indicates that alignment is actually necessary, often only a "touch up", will be required. The following Alignment Procedures will cover all alignment which will be necessary in the WJ-9478 Baseband Receiver Element. The last paragraphs (4.7.5) describes alignment of the Signal Path Assemblies. This alignment should RARELY be required.

4.7.1 1ST LO SYNTHESIZER

To align the 1st LO Synthesizer (A5), it is necessary to place the Synthesizer Assembly on a card extender. When the card is extended and the equipment set up as shown in **Figure 4-1**, perform the alignment steps which follow.

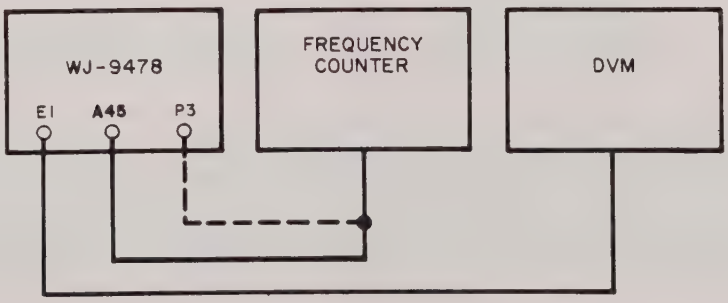


Figure 4-1. Equipment Setup for 1st LO Synthesizer Alignment

1. Connect the Frequency Counter to pin A45 and measure the reference frequency from the Reference Generator. The frequency should measure 1.000000 MHz.

2. Connect a Digital Voltmeter to pin E1.

3. Remove the VCO Cover and align the VCO from Band 0 to Band 3 following the VCO alignment documented in **Table 4-6.**

Table 4-6. VCO Alignment Adjustment Controls and Typical E1 Voltage

VCO Band	1st LO Freq.	Typical E1 Voltage	Adjust Component
0	42.91-46.90 MHz	-8.5 to 8.0	C6*, L1
1	46.91-50.90 MHz	-7.5 to 4.1	L2
2	50.91-54.90 MHz	-7.2 to 2.8	L3
3	54.91-58.90 MHz	-5.3 to 3.9	

NOTE

Interaction between the adjusted elements will necessitate realignment of proceeding adjustments to achieve the desired result. Always complete a final check with the cover on tight.

4. When alignment of the VCO is completed, connect the counter to P3 and tune the Baseband Receiver in 10 kHz steps, to verify proper operation of the VCO. (See dotted line in **Figure 1.**)

5. Check the output level which should be between +19 and +20 dBm into 50 ohms.

6. Remove the 1st LO Synthesizer from the card extender and return to the proper location in the Receiver Main Chassis.

4.7.2 2ND LO SYNTHESIZER ALIGNMENT

To align the 2nd LO Synthesizer, it will be necessary to extend the module. After extending the module, perform the following alignment steps, with the equipment setup as shown in **Figure 4-2.**

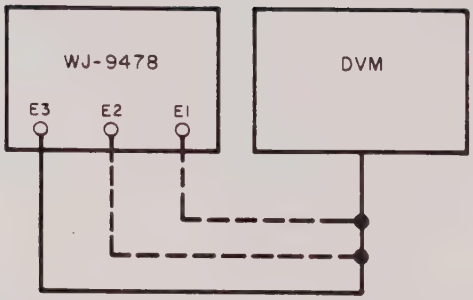


Figure 4-2. Equipment Setup for 2nd LO Synthesizer Alignment

1. Tune the WJ-9478 to 4.005000 MHz.

2. Use a digital voltmeter to measure the voltages given in **Table 4-7**, at the indicated E test points. If necessary, use the part listed in the table to adjust for the proper voltage.

Table 4-7. 2nd LO VCO Voltages, Test Points, and Adjusters

Test Point	Voltage	Adjust Component
E3	4.0 V ±0.1	L8
E1	3.0 V ±0.2	C51
E2	3.0 V ±0.2	C61

3. Tune the Baseband Receiver from 4.000000 MHz through 4.00999 MHz and verify that the 2nd LO frequency is correct and remains LOCKED. Note that the E3 voltage will vary, however it should remain within the range of 1.2 to 8.5 vdc.

4. Re-install the 2nd LO module in the main chassis and check the output level for -3 to +3 dBm (50 ohms).

4.7.3 3RD LO SYNTHESIZER ALIGNMENT

Alignment of the 3rd LO Synthesizer may be completed by setting up the test equipment as shown in **Figure 4-3** and performing the following steps.

1. Disconnect the cable from J1 on the LO assembly.
2. Connect a Spectrum Analyzer to J1.
3. Set the BW on the Baseband Receiver for 2.4 MHz BW.

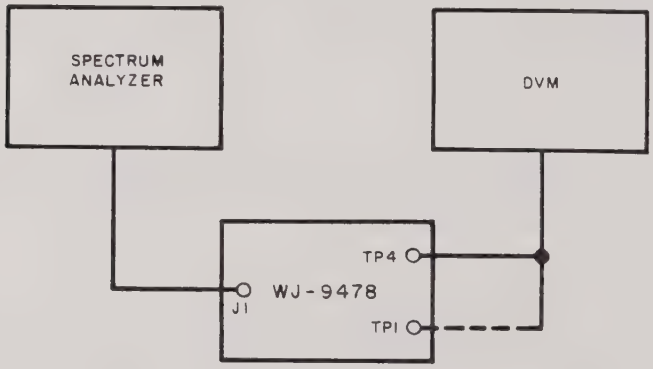


Figure 4-3. Equipment Setup for 3rd LO Synthesizer Alignment

4. Use a digital voltmeter to measure the voltage at Test Point 1 on the card. Voltage should read +16 volts, ±1/2 volt.
5. Adjust C27 for +16 volts, if step 4 was incorrect.
6. Setup the Spectrum Analyzer to view the output of the LO (J1) and set the center frequency at 29.8 MHz. Adjust the sweep for at least 100 kHz (50 kHz on either side of the 29.8 MHz.)
7. Check for a possible "spur" at 25 kHz below 29.8 MHz (29.775000 MHz), and 25 kHz above the center frequency (29.825000 MHz).
8. Adjust R7 (if necessary), to remove (or greatly reduce) the "spur". This spur is shown in **Figure 4-4** with a considerably misadjusted R7. This spur must be at least 50 dB below the center frequency level.

9. Disconnect the Spectrum Analyzer and DVM and reconnect the cable and connector to J1, previously removed.

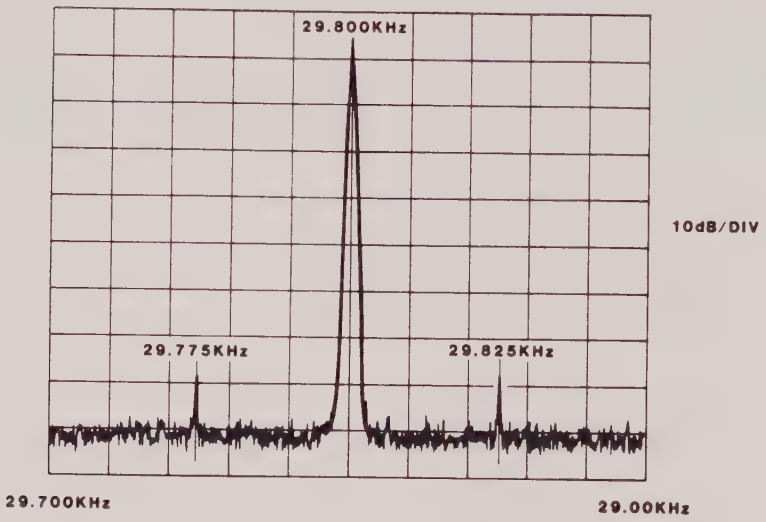


Figure 4-4. 3rd LO Output at 29.8 MHz Showing Possible Spurs at ±25 kHz

4.7.4 AGC ALIGNMENT

The AGC alignment is straight-forward and no difficulties are to be expected. Note that all mentions of measuring equipment in the following steps assume that 50 ohm loads are being used. For example, the dBm meter is with 50 ohm load, oscilloscope (when used) is with 50 ohm load, etc. Consulting the AGC Schematic Diagram No. 580743 will be beneficial.

1. Connect the RF Signal Generator to the input of the Baseband Receiver at Baseband Input jack, A2J1. Set output level for -50 dBm. Set the Receiver and Signal Generator to 10 MHz. (As shown in **Figure 4-5.**)

2. Select "MAN" GAIN mode and set gain control for MAX.

3. Use a DVM meter to make a reference voltage check at AGC OUTPUT 1, (pin 6 of J1). Voltage should be approximately +10 volts DC. Record Voltage measured.

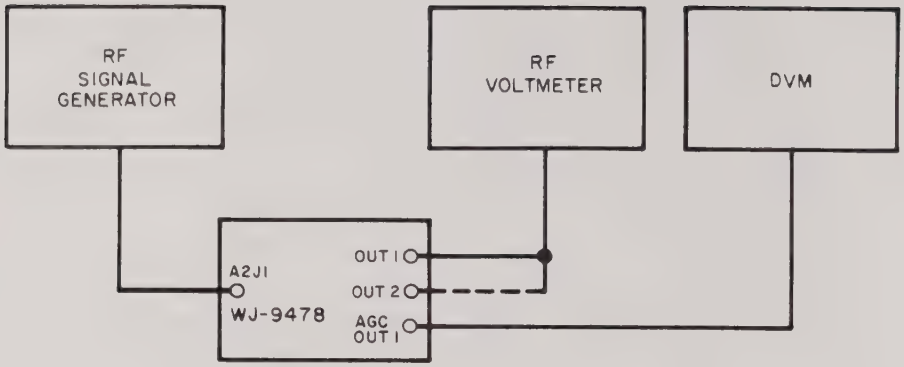


Figure 4-5. Equipment Setup for AGC Alignment

4. If the AGC Output 1 is not +10 volts, ±0.5 volts, adjust R62 for +10 volts at AGC Control output 1.

5. Select one of the three lower bandwidths (100, 150 or 300), and adjust R82 for +10 dBm at BASEBAND OUTPUT 1.

6. Select either the 2.4 or 1.0 MHz band width and adjust R88 for +10 dBm output at BASEBAND OUTPUT 1.

7. Check the voltage at AGC Control OUTPUT 2. This voltage should be the same as that at AGC Control OUTPUT 1.

CAUTION

Be careful NOT to short the OUTPUT 2 to GROUND. This may cause permanent damage to U12.

8. Set the Baseband Receiver Gain Control to MIN.

9. Adjust the Signal Generator output to -5 dBm.

10. Connect the RF dBm meter to the BASEBAND OUTPUT 1 of the Receiver and measure the output.

11. Adjust resistor R55 for +10 dBm output at BASEBAND OUTPUT 1 and 2.

12. Adjust the Signal Generator once again to -50 dBm output.

13. Set the Baseband Receiver to "AVG AGC".

14. Adjust resistor R70 for +10 dBm out at BASEBAND OUTPUTS 1 and 2. (This sets the Average AGC circuits.)

15. Check the output at BASEBAND OUTPUT 1 and 2 while changing the Signal Generator output between -50 and -5 dBm. The output should not increase more than +1.5 dBm within this range.

16. Select "AGC PEAK" on the Baseband Receiver front panel.

17. Adjust the Signal Generator output for -50 dBm.

18. Adjust resistor R18 for +10 dBm output at BASEBAND OUTPUTS 1 and 2.

19. Check this output at various Signal Generator power settings between -50 and -5 dBm. The Receiver output should remain at +10 dBm and not increase more than +1.5 dBm. (This sets the PEAK AGC circuits.)

20. Remove the Signal Generator input to the Receiver.

21. Select Manual mode.

22. Adjust resistor R22 for "ZERO" on "SIG LEVEL" meter.

23. Re-connect the Signal Generator and set output for -50 dBm.

24. Turn the Receiver GAIN control to MAX.

25. Adjust resistor R20 to place the pointer ("needle") of the meter at the "SET" mark on the meter scale.

4.7.5 SIGNAL PATH ALIGNMENT

In performing the various performance tests given in this section of the manual, the over-all performance level of the Baseband Receiver should be determined. If the tests indicate that there may be an alignment problem in the converters or mixers, then the following alignment procedures for the signal path should be checked. Note that, by setting up the equipment for each stage and making the checks given, the alignment of stage under test will be determined. At that time it can be determined if alignment of THAT stage is actually needed. If it is, the steps which follow will describe how it is to be done. Note that a Spectrum Analyzer IS REQUIRED FOR THIS ALIGNMENT. Equipment setups are illustrated where necessary.

4.7.5.1 Input Filter (A2)

The Input Filter is a bandpass filter which is factory preset and should not need to be re-aligned. However, to check the alignment connect the test equipment as follows. The test equipment setup for the Input Filter is shown in **Figure 4-6.**

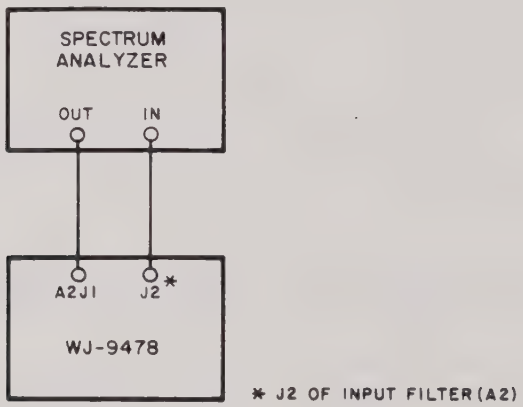


Figure 4-6. Equipment Setup for Input Filter Alignment

1. Disconnect the cable from connector J2 of the Input Filter and connect the Analyzer input. Connect the output of the Spectrum Analyzer (or a sweep generator), to the Baseband Receiver Input Connector A2J1. Note that the spectrum analyzer should be equipped with a tracing generator.

2. Set the generator to sweep from 100 kHz (Start) to 50 MHz (Stop), with the output level at a value between -50 and -5 dBm.

3. Set the Spectrum Analyzer for 10 dB/dv.

4. Compare the waveform on the Analyzer with that show in **Figure 4-7.**

5. The Input Filter is basically a bandpass filter with a sharp roll-off for frequencies above 21 MHz. Note that the curve should indicate that 21.5 MHz is down 3 dB if the Filter alignment is correct.

FIGURE 4-7
FIGURE 4-8

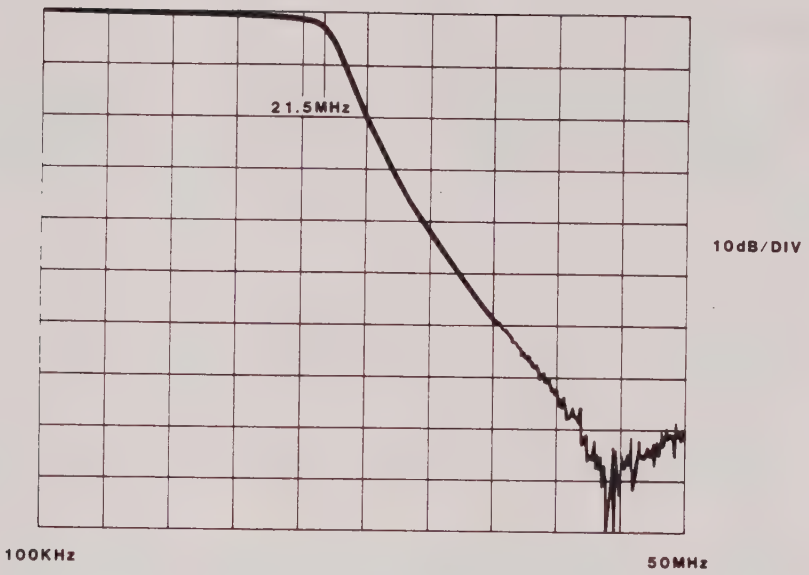


Figure 4-7. Frequency Response of the Input Filter (A2)

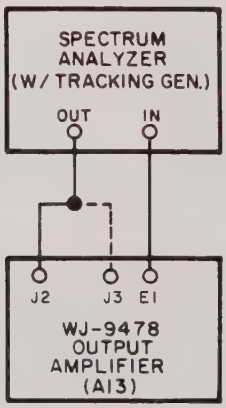


Figure 4-8. Equipment Setup for All the Video Filters

4.7.5.2 Video Filters (A13)

There are four Video Filters used (as discussed in Section III of this manual), each designed for use with a particular IF bandwidth filter, except for the Video Filter which is used for BOTH the 100 and 300 kHz BW frequencies. While the filters should NOT require re-alignment, the procedure for checking the alignment and re-aligning it if necessary, is given in the next paragraphs.

4.7.5.2.1 **125 kHz Center Frequency Bandwidth Video Filter**

To check the alignment of the 125 kHz center frequency Video Filter, (for a 150 kHz Bandwidth Filter), perform the following steps. (See **Figure 4-8.**)

1. Disconnect the cable which is connected to J2 of the Output Amplifier (A13) and connect the Tracking Generator output of a Spectrum Analyzer to this jack.

2. Connect the Spectrum Analyzer input to the Receiver BASEBAND OUTPUT jack, J1.

3. Set up the analyzer as follows:

   a. Start: 0 Hz
   b. Stop: 500 kHz
   c. 1 dB per division

4. Select the 150 kHz Bandwidth filter at the Baseband Receiver front panel.

5. Look at the waveform shown on the Analyzer and compare with that shown in **Figure 4-9.**

6. Should the trace on the Analyzer be sufficiently different from that in **Figure 4-9** that alignment is indicated, be sure that the circuit is working properly as discussed throughout this chapter. Then, if necessary, continue.

7. If necessary, adjust L10 and L11 to achieve a wave-shape like that shown in **Figure 4-9.** Be sure that the 320 kHz point is down 3 dB below the average flat response curve. The adjustments will have to be repeated several times due to interaction between L10 and L11.

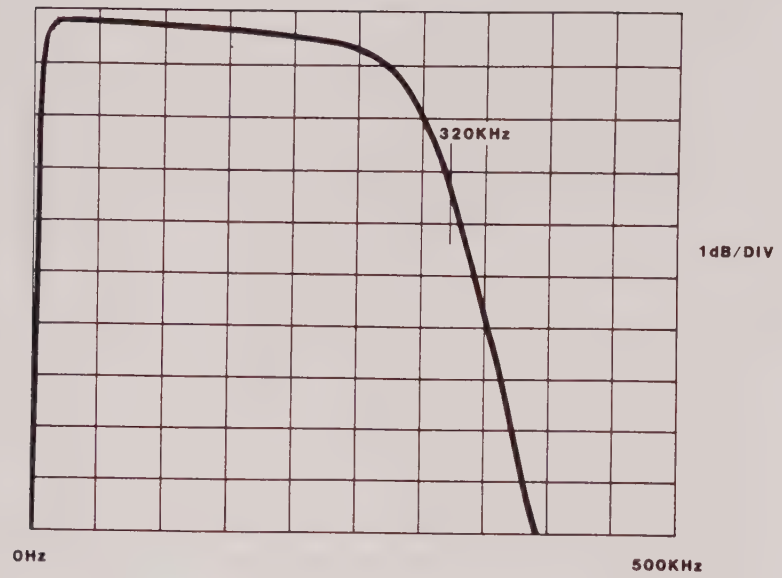


Figure 4-9. Frequency Response for the 125 kHz Center, 150 kHz Frequency IF BW, Video Filter

4.7.5.2.2 **200 kHz Center Frequency Bandwidth Video Filter**

Alignment of the 200 kHz and 300 kHz Bandwidth center frequency IF Bandwidth, Video Filters may be checked (and if necessary aligned), by performing the following steps.

1. Use the same setup as that used in **paragraph 4.7.5.2.1, Figure 4-8.**

2. Select the 300 kHz bandwidth filter at the Receiver front panel.

3. Connect Spectrum Analyzer input to J2 of the Output Amplifier, (if not already connected). Set up the Analyzer as follows:

   a. Start: 0
   b. Stop: 800 kHz
   c. 1 dB per division

4. Compare the trace on the Analyzer with that shown in **Figure 4-10.** The crest of the curve should be relatively flat as shown. The 540 kHz point of the curve should be down 3 dB. If alignment is indicated, continue with step 5.

5. Adjust L12 and L13 to obtain a curve which approximates that shown in **Figure 4-10.** (It may be necessary to repeat the adjustment of L12 and L13, there is some interaction between these two adjustments.

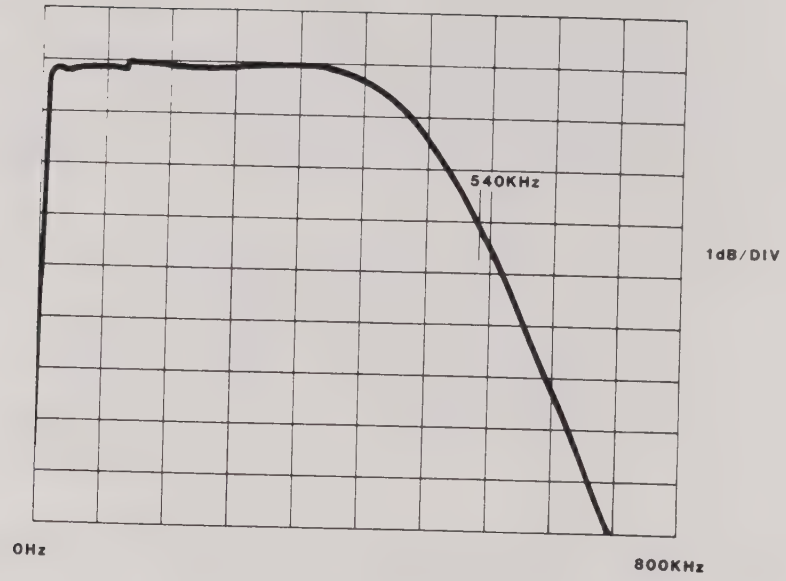


Figure 4-10. Frequency Response for the 300 kHz IF BW Video Filter

4.7.5.2.3 **4.2 MHz Center Frequency IF Bandwidth Video Filter**

To check the alignment of the Video Filter used with the 1 MHz bandwidth IF filter, perform the following steps.

1. Connect and adjust the test equipment as in step 1 of 4.7.5.2.1. (**Figure 4-8**), except for the Analyzer settings which are given below in step 3, and connecting the Tracking Generator output to J3 of the Output Amplifier instead of J2.

2. Select the 1 MHz bandwidth at the front panel of the Receiver.

3. Setup the Analyzer as follows:

   a. Start: 0 Hz
   b. Stop: 3 MHz
   c. 1 dB per division

4. Compare the trace on the Analyzer with that of **Figure 4-11.**

5. If alignment is deemed necessary, proceed to step 6.

6. Adjust inductor L154 and L16 to produce a flat response between 0 and 1 MHz, with rapid drop beyond 2.0 MHz. Repeat adjustment between L15 and L16 as many times as required.

FIGURE 4-11
FIGURE 4-12

Figure 4-11. Frequency Response of the Video Filter Used With the 1 MHz IF BW

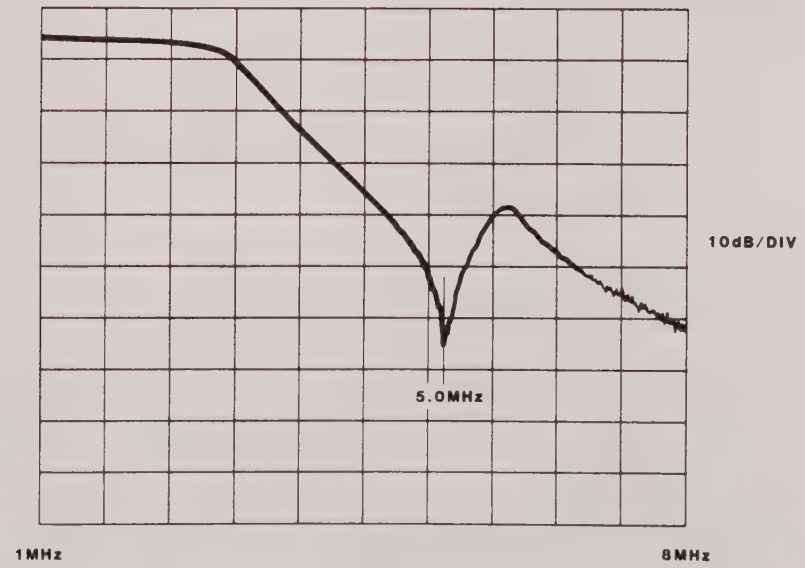


Figure 4-12. Frequency Response of the Video Filter Used With the 2.4 MHz IF BW

7. Leave equipment connected as at present, but change the Spectrum Analyzer as follows:

   a. Start: 1 MHz
   b. Stop: 8 MHz
   c. 10 dB per division

8. L14 and C51 for a series resonant circuit. Due to the fact that the impedance of a series circuit at resonance is near zero, the circuit is used to trap out 5 MHz signals which may be present from the 4th LO signal. The trace is shown in **Figure 4-12.**

9. Adjust L14 for the greatest reduction of 5 MHz energy while not reducing signal level of the desired bandpass, 0 to 1.0 MHz.

10. Now redo steps 1 through 5 to be sure that there is NO significant change in the wave shape or amplitude of 0 Hz to 1.5 MHz. If necessary, redo step 6.

4.7.5.2.4 8.4 MHz Center Frequency IF Filter, Video Filter

To check the alignment of the 2.4 MHz bandwidth Video Filter, complete the following steps. (Note that there are TWO filters used in the 2.4 MHz IF BW Video Filter. A High Pass filter is used first, followed by a Low Pass filter. The High Pass filter is checked/aligned first.)

HIGH PASS FILTER

1. Setup the equipment as in Step 1 of 4.7.5.2.1, except for the Analyzer settings which are given in the next step.

2. Select the 2.4 MHz bandwidth filter on the Receiver front panel.

3. Setup the Analyzer as follows:

   a. Start: 40 kHz
   c. 10 dB per division
   b. Stop: 180 kHz

4. Compare the trace on the Analyzer to that of **Figure 4-13.** If the notches are in the proper locations and curve very similar to **Figure 4-13,** then alignment is NOT necessary. If not o.k., complete step 5.

5. Adjust the inductors given below in **Table 4-8** as indicated. These are all NOTCH filters. Adjust each for the frequency given for MZX notch at the given frequency. Use the Spectrum Analyzer for indication of proper notch locations and to check the depth of the notch. Note that there may be some interaction between the adjustments and adjustments will have to be repeated, until all notches compare with **Figure 4-13.**

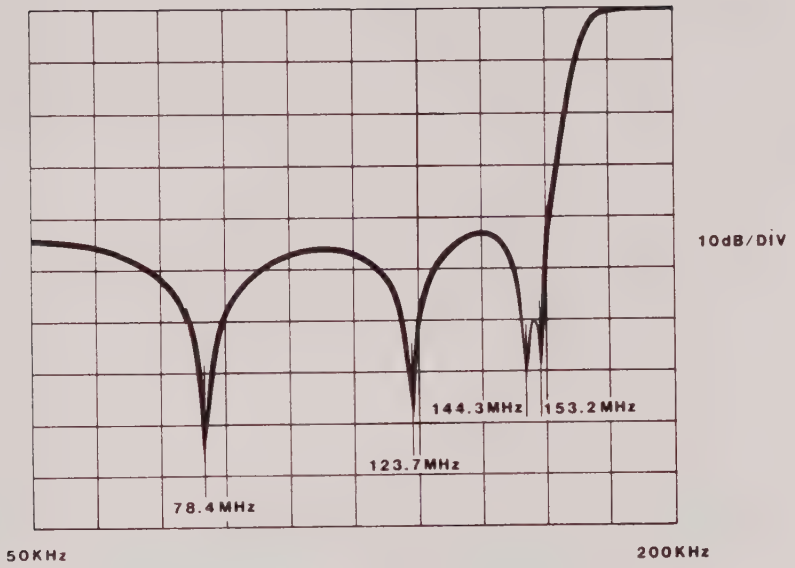


Figure 4-13. Output Response Curve Showing Notch Locations of HPF Used With The 2.4 MHz Bandwidth

Table 4-8. Notch Filter Adjustments for 2.4 MHz BW Video Filter

Adjust	Frequency
L23	78.400 kHz
L22	123.700 kHz
L24	144.300 kHz
L21	153.200 kHz

LOW PASS FILTER

1. The LPF (low pass filter) is checked next. This is a four section filter which has four variable inductors. The test equipment remains connected as in the High Pass Filter (Step 1 above), and adjusted the same except for the following: Change the following settings of the Analyzer generator output:

   a. Start: 2 MHz
   b. Stop: 8 MHz
   c. dB per Division remains the same, at 10 dB

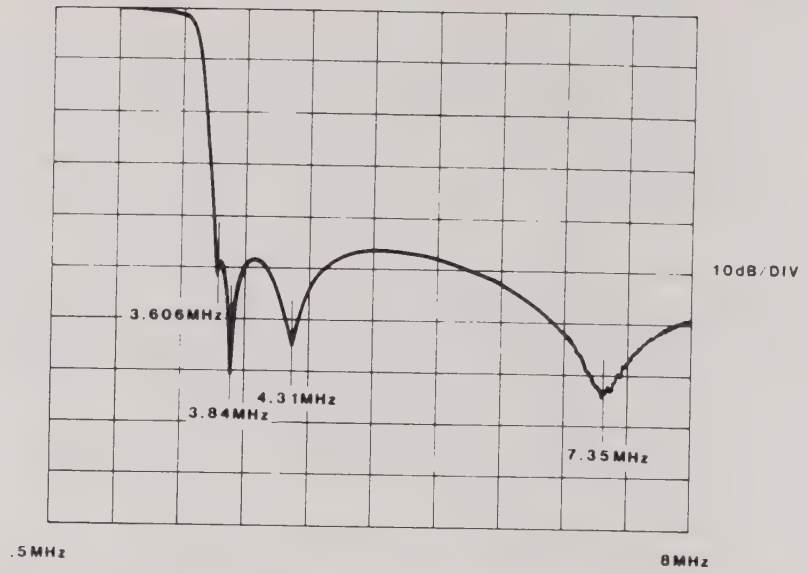


Figure 4-14. Output Response Curve Showing Notch Locations of LPF Used With the 2.4 MHz Bandwidth

2. Check the shape of the output curve, shown in **Figure 4-14**, and set the Analyzer marker for each of the frequencies shown in **Table 4-8** to determine if the notches are at the proper frequency locations. If they are VERY close to the proper frequency, alignment of the LPF is NOT required. If the frequencies are not right, proceed with step 3.

3. Adjust each of the Inductors to the notch locations shown in **Table 4-9.** Adjustment of the inductors will have an effect primarily on the LOCATION of the notch and NOT much effect on the SHAPE. Using the Analyzer, locate each of the notch frequencies to the proper position.

Table 4-9. Proper Notch Locations for 2.4 MHz High Pass Filter

Adjust	Frequency
L23	3.606 MHz
L22	3.804 MHz
L24	4.310 MHz
L21	7.350 MHz

4. When each of the notch frequencies have been adjusted, remove test equipment.

4.7.6 AGC TIME CONSTANT ALIGNMENT

NOTE

Alignment of the AGC time constants should NOT be required. Make sure that it is actually required before performing the following procedures.

4.7.6.1 Alignment of the AGC Average Time Constants

The following procedure may be used to align the Time Constant Circuits of the AGC Average circuitry. DO NOT ATTEMPT TO PERFORM THE FOLLOWING UNLESS ALL OF THE TEST EQUIPMENT REQUIRED IS AVAILABLE! Test Equipment for AGC Time Constant Alignment includes:

Signal Generator	Mixer
Spectrum Analyzer	Tee
Storage Oscilloscope	Test Cable
Two Pulse Generator	

If alignment is required, connect the test equipment as shown in **Figure 4-15.** Perform the following steps to align the AGC Average Time Constant circuits.

(Note that the following four steps are performed to be sure that the AGC circuit is operating properly and the baseband output at Output 1 remains at the proper level. Steps 5 and beyond should NOT be attempted if the results are within the specified limits.)

1. As shown in **Figure 4-15,** connect each of the pieces of equipment and make adjustments of them as follows:

   a. Set the signal generator frequency to 5000 kHz
   b. Set the signal generator output level to -5 dBm

2. Set up the Baseband Receiver as follows:

   a. Frequency to 5000 kHz
   b. Gain Control mode to AGC Average
   c. IF Bandwidth to 2.4 MHz
   d. AGC Time Constant to 1 ms

3. Note the level which is indicated on the AC voltmeter to secure a reference value.

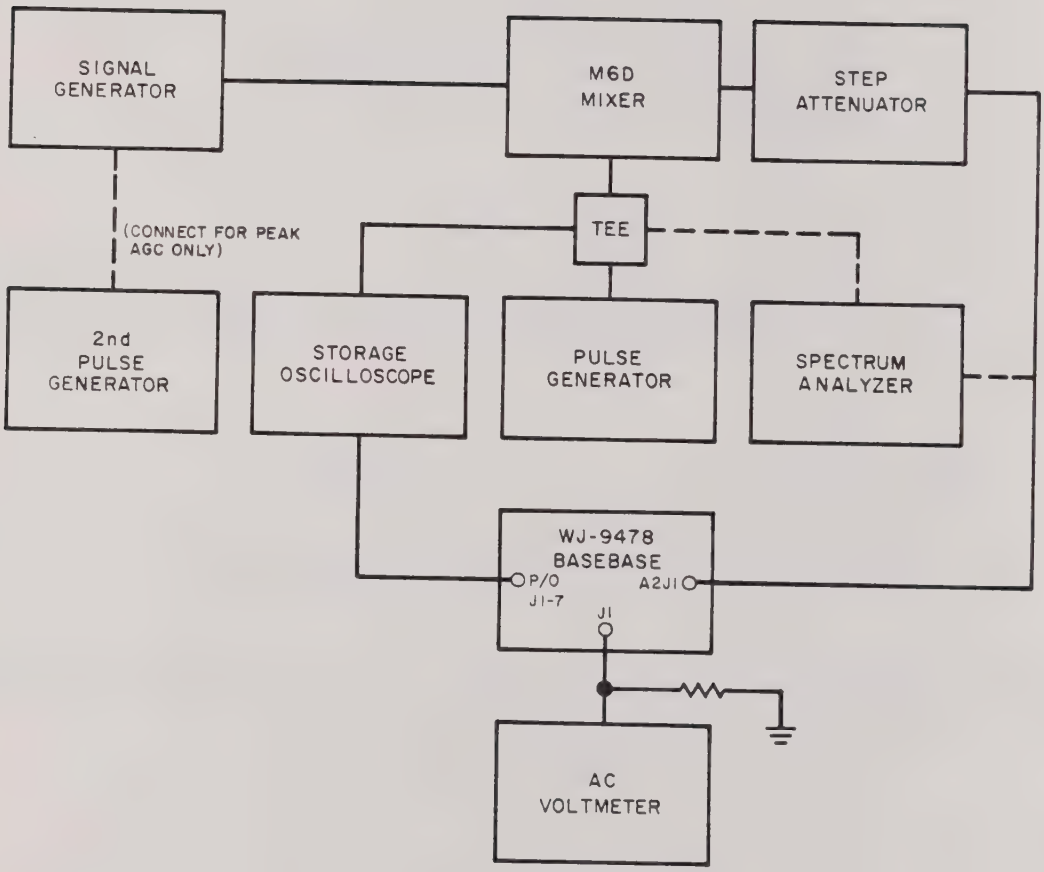


Figure 4-15. Equipment Connections for AGC Time Constant Alignment

4. Reduce the signal generator level to -50 dBm and check to be sure that the change in output level stayed within 0.1 dBm from the desired +10 dBm level. If the output level remains within the tolerance, proceed to step 5.

5. Set up the test equipment as shown in **Figure 4-15** and set the controls as follows:

SPECTRUM ANALYZER

Center Frequency	5000 kHz
Resolution Bandwidth	100 kHz
Reference Level	-5 dBm
dB/Div	10 dBm
Span	0 kHz
Scan Mode	Internal
Scan Triggering	External (or Video)

PULSE GENERATOR

Frequency of Repetition	100 Hz
Mode	Continuous
Waveform	Squarewave
Sweep Time	Off
Output Level	-20 dB
Output Level Vernier	See Text

OSCILLOSCOPE

Channel 1 volts/div	0.2 volts
Channel 2 volts/div	0.1 volts
Time/div	200 microseconds
Vertical Mode	Add
Channel 1 Coupling	DC
Channel 2 Coupling	Ground
Trigger Mode	Normal
Trigger Source	External

VARIABLE ATTENUATOR

Attenuation	0 dB

6. Adjust the output amplitude of the signal generator until the maximum amplitude, as displayed on the spectrum analyzer, is -5dBm.

7. Adjust the output AMPLITUDE and DC OFFSET of the pulse generator so that the change in signal amplitude with the mixer being turned "ON and OFF", is 10 dB. The object is to have the output amplitude of the mixer toggle between -5 and -15 dBm.

8. Disconnect the spectrum analyzer from the step attenuator and connect the attenuator to the RF input of the Baseband Receiver, (A2J1) as shown by the dotted lines in **Figure 4-15.** Disconnect the trigger lead from the pulse generator to the spectrum analyzer and connect it to the trigger input of the storage oscilloscope using a "TEE", so that the M6D mixer will also remain connected to the pulse generator output.

9. Connect channel 1 of the oscilloscope to the AGC control voltage bus in the Baseband Receiver, which may be accessed at "GC CTL No. 2".

10. Adjust the oscilloscope centering controls for an on screen trace and using the step attenuator, switch 1 dB of attenuation into the circuit. Then adjust the vertical position control of the oscilloscope to establish a reference. Now switch the 1 dB attenuation out of the circuit.

11. While looking at the oscilloscope display, determine the time required for the AGC voltage to settle to within 1 dB of the final value.

12. Using the established reference on the storage oscilloscope, determine if the AGC voltage trace developed, settles within 1 ms.

13. Should the trace NOT settle within 1 ms, variable potentiometer R35 should be adjusted slightly. Then perform steps 10 through 12 again until the settling requires between 0.5 and 1.0 ms.

14. Check the settling of each of the other four Time Constant circuits of the Average AGC using steps 10 through 12 for each one. If any of them do not settle within the time of 0.5 to 1.0 ms, adjust the appropriate potentiometer. The particulars for the test and/or adjustment of each of the five Average Time Constant circuits is given in **Table 4-10.** Use this table to perform the check/adjustment of the four Average Time Constant Circuits.

Table 4-10. Specifics for the Five Average Time Constants Check/Adjust

BB Receiver TC Selected	Pulse Generator Repetition Rate	Oscilloscope Sweep Time	Adjust Potentiometer Number
1 ms	100 Hz	0.2 ms	R35
3 ms	30 Hz	0.5 ms	R37
10 ms	10 Hz	2.0 ms	R39
30 ms	3 Hz	5.0 ms	R41
100 ms	1 Hz	20.0 ms	R43

4.7.6.2 Alignment of the AGC Peak Time Constant Circuits

As mentioned earlier, there is a separate AGC circuit used for Peak AGC. These circuits have separate adjustments. The following procedures are used to test and/or adjust these circuits.

1. Set up the test equipment as in **paragraphs 4.7.6.1.**

2. In addition, connect a second pulse generator to the AM input of the signal generator. (Reference **Figure 4-15.**)

3. Set up the second pulse generator as follows:

Pulse Width	2 microsec
Pulse Repetition Rate	50 microsec
Output Amplitude	See Text

4. Adjust the signal generator as follows:

Tune Frequency	10 MHz
Output Amplitude	0 dBm

5. Adjust the Baseband Receiver Element as follows:

Tuned Frequency	10 MHz
Gain Control Mode	AGC Peak
IF Bandwidth	2.4 MHz
AGC Time Constant	1 ms

6. Reset the step attenuator to 0 dB.

7. Adjust the vertical position controls of the oscilloscope to locate a trace on the screen. Use the step attenuator to switch in 1 dB of attenuation. Adjust the vertical position control to establish a reference. Now switch out the 1 dB of attenuation.

8. While observing the storage oscilloscope, determine that the time required for the AGC voltage to settle to 1 dB of the final of the value is within 0.5 to 1.0 ms, using the reference established.

9. If the AGC voltage does NOT settle within the required time, adjust variable potentiometer R46 and perform steps 7 and 8 again. Continue until the settle time is between 0.5 and 1.0.

10. Check the remaining four time constants using the information in **Table 4-11** and, if necessary, adjust the potentiometer listed in the table for the time constant value under adjustment.

Table 4-11. Specifics for the Five Peak AGC Time Constants

BB Receiver TC Selected	Pulse Generator Repetition Rate	Oscilloscope Sweep Time	Adjust Potentiometer Number
1 ms	100 Hz	0.2 ms	R46
3 ms	30 Hz	0.5 ms	R48
10 ms	10 Hz	2.0 ms	R50
30 ms	3 Hz	5.0 ms	R52
100 ms	1 Hz	20.0 ms	R54

This completes alignment of the AGC Time constant circuits.

SECTION V

REPLACEMENT PARTS LIST

SECTION V

REPLACEMENT PARTS LIST

5.1 UNIT NUMBERING METHOD

The method of numbering used throughout the unit is assigning reference designations (electrical symbol numbers) to identify: assemblies, subassemblies, modules within a subassembly, and discrete components. An example of the unit numbering method used is as follows:

Subassembly Designation A1	R1 Class and No. of Item
Identify from right to left as:	First (1) resistor (R) of First (1) subassembly (A)

On the main chassis schematic, components which are an integral part of the main chassis have no subassembly designations.

5.2 REFERENCE DESIGNATION PREFIX

The use of partial reference designations are used on the equipment and on the manual illustrations. This partial reference designation consists of the component type letter(s) and the identifying component number. The complete reference designation may be obtained by placing the proper prefix before the partial reference designation. Reference designation prefixes are included on the drawings and illustrations in the figure titles (in parenthesis).

5.3 LIST OF MANUFACTURERS

Mfr. Code	Name and Address
00779	Amp Inc. P.O. Box 3608 Harrisburg, PA 17105
01037	Pyroferric - New York, Inc. 621 E. 216th Bronx, NY 10467
01121	Allen-Bradley Company 1201 South 2nd Street Milwaukee, WI 53204
01281	TRW Incorporated Semiconductor Group 14520 Aviation Boulevard Lawndale, CA 90260
01295	Texas Instruments Inc. Semiconductor Group 13500 N. Central Expressway Dallas, TX 75231
02114	Ferroxcube Corp. 5083 Kings Highway Saugerties, NY 12477

Mfr. Code	Name and Address
02660	Bunker-Ramo Corporation 2801 South 25th Avenue Broadview, IL 60153
02735	RCA Corp. Solid State Division Route 202 Somerville, NJ 08876
04013	Tarsus Corp. 1 Academy Hill P. O. Box 278 Lambertville, NJ 08530
04099	Capco Uncorp P.O. Box 2164 Grand Junction, CO 81501
04713	Motorola Semiconductor Product Sales Sub. of Motorola Inc. 5005 East McDowell Road Phoenix, AZ 85008
05236	Johathan Mfg. Corp. 1101 Sacacia Ave. Fullerton, CA 92631
06776	Roberson - Nugent - Inc. 800 E. 8th Street P.O. Box 1208 New Albany, IN 47150
07263	Fairchild Camera and Instrument Corp. Semiconductor Div. 464 Ellis Street Mountain View, CA 94042
09021	Airco Inc. Airco Electronics Bradford, PA
12515	Teledyne Thermatics P.O. Drawer 505 Elm City, NC 27822
13103	Thermalloy Company, Inc. 2021 W. Valley View Lane Dallas, TX 75234
14482	Watkins-Johnson 3333 Hillview Avenue Palo Alto, CA 94304
14632	Watkins-Johnson Co. SP Division 700 Quince Orchard Road Gaithersburg, MD 20878
14655	Cornell-Dubilier Elec. Div. of Federal Pacific Co. c/o Gov't Contracts Dept. 150 Avenue L Newark, NJ 07101
15542	Mini-Circuits Laboratory Div. of Scientific Comp. Corp. 2913 Quentin Road Brooklyn, NY 11229
16428	Belden Corporation P O. Box 1101 Richmond, IND 47374
17217	Gore WL and Associates Inc. 555 Paper Mill Road Newark, DE 19711
17856	Siliconix Inc. 2201 Laurelwood Road Santa Clara, CA 95050

Mfr. Code	Name and Address
18324	Signetics Corporation 811 East Arquest Avenue Sunnyvale, CA 94086
18565	Chomerics Inc. 77 Dragon Court Woburn, MA 01801
19080	Robinson Electronics Inc. 3580 Sacramento Drive P.O. Box Y San Luis, Obispo, CA 93406
19209	General Electric Company Battery Business Dept. 441 Highway N. Gainsville, FL 32602
19505	Applied Engineering Prod. Co. Div. of Samarius, Inc. 300 Seymour Avenue Derby, CT 06418
24355	Analog Devices Inc. Rt. 1 Industrial Park P.O. Box 280 Norwood, MA 02062
27014	National Semiconductor Corp. 2950 San Ysidro Way Santa Clara, CA 95051
27193	Eaton Corporation 1127 W. St. Paul Ave. Milwaukee, WI 53233
27956	Relcom 3333 Hillview Avenue Palo Alto, CA 94304
28480	Hewlett-Packard Company Corporate Headquarters 3000 Hanover Street Palo Alto, CA 94304
29990	American Technical Ceramics 1 Norden Lane Huntington Station, NY 11746
31745	Rogers Corporation Williamsfield & Dalison Rd. P.O. Box 700 Chandler, AZ 85224
32293	Intersil Inc. 10900 N. Tantau Avenue Cupertine, CA 95014
33095	Spectrum Control Inc. 152 E. Main Street Fairview, PA 16415
34371	Harris Semiconductor Div. P.O. Box 883 Melbourne, FL 32901
34649	Intel Corporation 3585 SW 198th Avenue Aloha, OR 97005
36665	Mitel Corporation 350 Leggett Drive P.O. Box 13089 Kanata, Ont. Canada K2K 1X3
37942	P. R. Mallory and Co., Inc. 3029 E. Washington Street Indianapolis, IN 46206
4W715	Linear Technology 1630 McCarthy Blvd. Milpitas, CA 95035
51406	Murata Erie North Amer. 3002 A. Kensington Court Marietta, GA 30067

Mfr. Code	Name and Address
51642	Centre Eng. 2830 E. College Ave. State College, PA 16801
52648	Plessey Memories Inc. DBA Plessey Semiconductors 1674 McGraw Avenue Irvine, CA 92714
52673	KSW Electronics Corp. South Bedford Street Burlington, MA 01803
55027	Q-Bit Corporation 311 Pacific Ave. Palm Bay, FL 32905
56289	Sprague Electric Co. 87 Marshall Street North Adams, MA 01247
59660	Tusonix Inc. 2155 N. Forbes Blvd. Suite 107 Tuscon, AZ 85745
62786	Hitachi America 1800 Bering Dr. San Jose, CA 95122
70903	Belden Corp. 415 South Kilpatrick Chicago, IL 60644
71279	Cambridge Thermionic Corp. 445 Concord Avenue Cambridge, MA 02138
71400	Bussman Manufacturing 2536 West University St. St. Louis, MO 63107
71785	TRW Electronic Components 1501 Morse Ave. Elk Grove Village, IL 60007
72136	Electro Motive Mfg, Co., Inc. South Park & John Street Millimantic, CT 06226
72982	Erie Technological Products Inc. 2155 North Forbes Suite 10718 Tuscon, AZ 85705
73138	Beckman Instruments Inc. Helipot Div. 2500 Harbor Boulevard Fullerton, CA 92634
73899	JFD Electronics Co. 112 Mott Street Oceanside, NY 11572
75915	Littlefuse, Inc. 800 E. Northwest Highway Des Plaines, IL 60016
80058	Joint Electronics Type Designation System
80131	Electronic Industries Assoc. 2001 Eye Street, N. W. Washington, DC 20006
81073	Grayhill Inc. 561 Hillgrove Avenue La Grange, IL 60525
81349	Military Specifications
81350	Joint Army-Navy Specifications
83701	Electronics Devices Inc. 21 Gray Oaks Ave. Yonkers, NY 10710

Mfr. Code	Name and Address
84048	Vernitron Corp. 2801 72nd St. North P.O. Box 44000 St. Petersburg, FL 33743
84411	TRW Inc. Electronics Comp. Div. TRW Capacitors 301 W. O Street Ogallala, NE 69153
91293	Johanson Mfg Co. P.O. Box 329 Boonton, NJ 07005
91418	Radio Materials Corp. 4242 Byrn Mawr Avenue W. Chicago, IL 60646
91506	Augat Inc. 33 Perry Avenue Atleboro, MA 02703
91984	Maida Development Co. 214 Academy Street Hampton, VA 23369
95121	Quality Components Inc. P.O. Box 113 St. Mary's, PA 15857
95146	Alco Electronics Products, Inc. 1551 Osgood Street North Andover, MA 01845
96906	Military Standards
98291	Sealectro Corp. 225 Hoyt Mamaroneck, NY 10544
99800	American Precision Ind. Inc. Delevan Electronics Div. 270 Quaker Road East Aurora, NY 14052
99848	Wilco Corp. 4030 W. 10th Street P.O. Box 22248 Indianapolis, IN 46222

5.4 PARTS LIST

The following parts lists contain all the electrical components used in the unit, along with mechanical parts which may be subject to unusual wear or damage. When ordering replacement parts from the Watkins-Johnson Company, specify the unit type and serial number. Also include the reference designation and the description of each item ordered. The list of manufacturers, provided in **paragraph 5.3**, and the manufacturer's part number, provided in **paragraph 5.5**, are supplied as a guide to aid the user of the equiment while in the field. The parts listed may not necessarily be identical with the parts installed in the unit. The parts listed in **paragraph 5.5** will provide for satisfactory unit operation.

Replacement parts may be obtained from any manufacturer provided that the physical characteristics and electrical parameters of the replacement item are compatible with the original part. In the case where components are defined by a military or industrial specification, a vendor which can provide the necessary component is suggested as a convenience to the user.

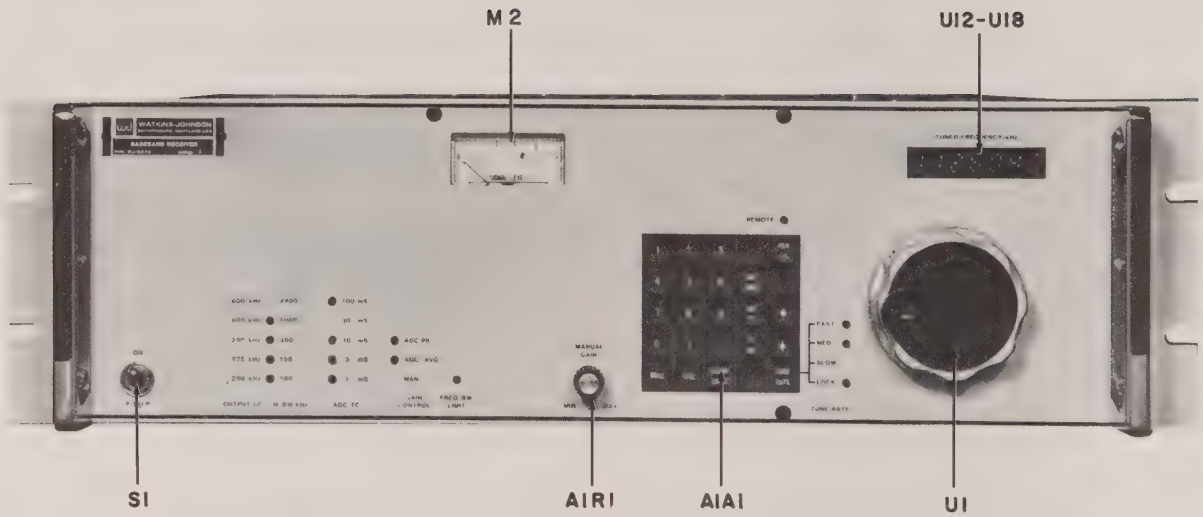


Figure 5-1. WJ-9478 Baseband Receiver Front View, Located of Components

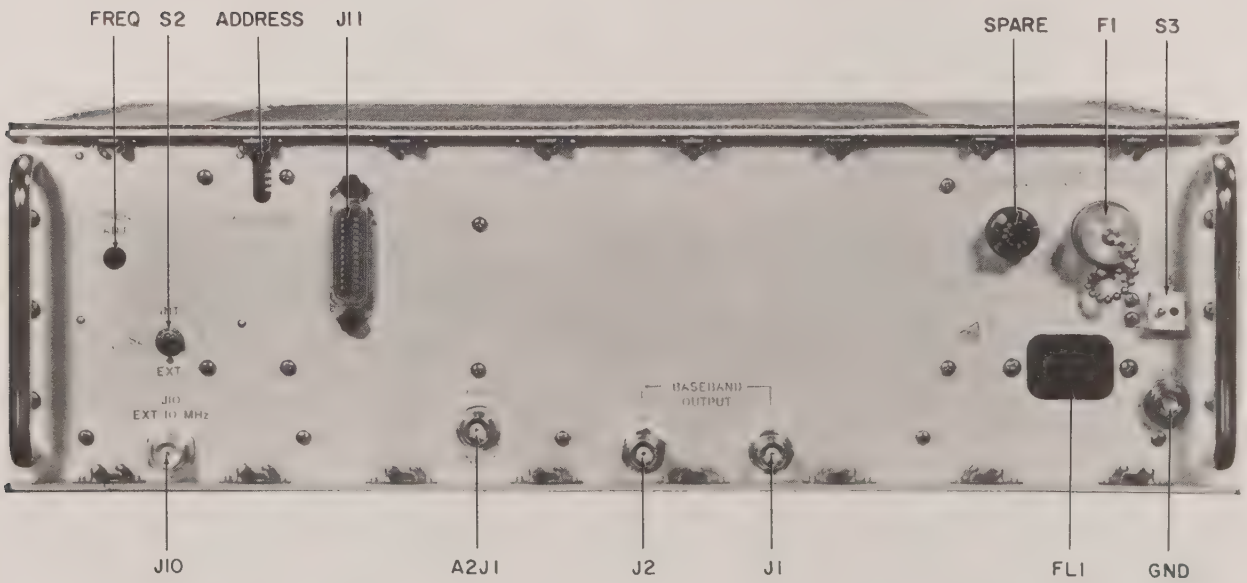


Figure 5-2. WJ-9478 Baseband Receiver Rear View, Location of Components

5.5 TYPE WJ-9478 BASEBAND RECEIVER

REF DESIG PREFIX **MAIN CHASSIS**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	Front Panel Display Assembly	1	796273-6	14632	
A2	Input Filter Assembly	1	796659-1	14632	
A3	Input Converter Assembly	1	796650-1	14632	
A4	Reference Generator Assembly	1	796628-1	14632	
A5	1st LO Synthesizer	1	796453-1	14632	
A6	2nd LO Synthesizer	1	796266-1	14632	
A7	I/O Interface	1	796282-2	14632	
A8	Microprocessor Control	1	796623-3	14632	
A9	IF Filter, Selector	1	796649-1	14632	
A10	Third Converter	1	796651-1	14632	
A11	Third LO Synthesizer	1	796655-1	14632	
A12	Fourth Converter	1	796652-1	14632	
A13	Output Filter, Driver	1	481097-1	14632	
C1	Capacitor, Electrolytic, Aluminum: 8200 µF, ±20%, 35 V	2	622D812MO35AB2A	56289	
C2	Same as C1				
C3	Capacitor, Electrolytic, Aluminum: 18000 µF, ±20%, 16 V	1	622D183M016AB2A	56289	
C4	Capacitor, Electrolytic, Tantalum: 2.2 µF, 10%, 35 V	6	CS13BF225K	81349	
C5	Capacitor, Electrolytic, Tantalum: 4.7 µF, 10%, 35 V	7	CS13BF475K	81349	
C6	Not Used				
C7	Same as C4				
C8	Same as C5				
C9	Same as C4				
C10	Same as C5				
C11	Same as C4				
C12	Same as C5				
C13	Same as C4				
C14	Same as C5				
C15	Same as C4				
C16	Same as C5				
C17	Capacitor, Electrolytic, Tantalum: 100 µF, 20%, 20 V	1	196D107X0020TE4	56289	
C18	Same as C5				
C19	Not Used				
C20	Capacitor, Ceramic, Feedthru: .05 µF, 300 V	5	54-785-005-503P	33095	
C21 Thru C24	Same as C20				

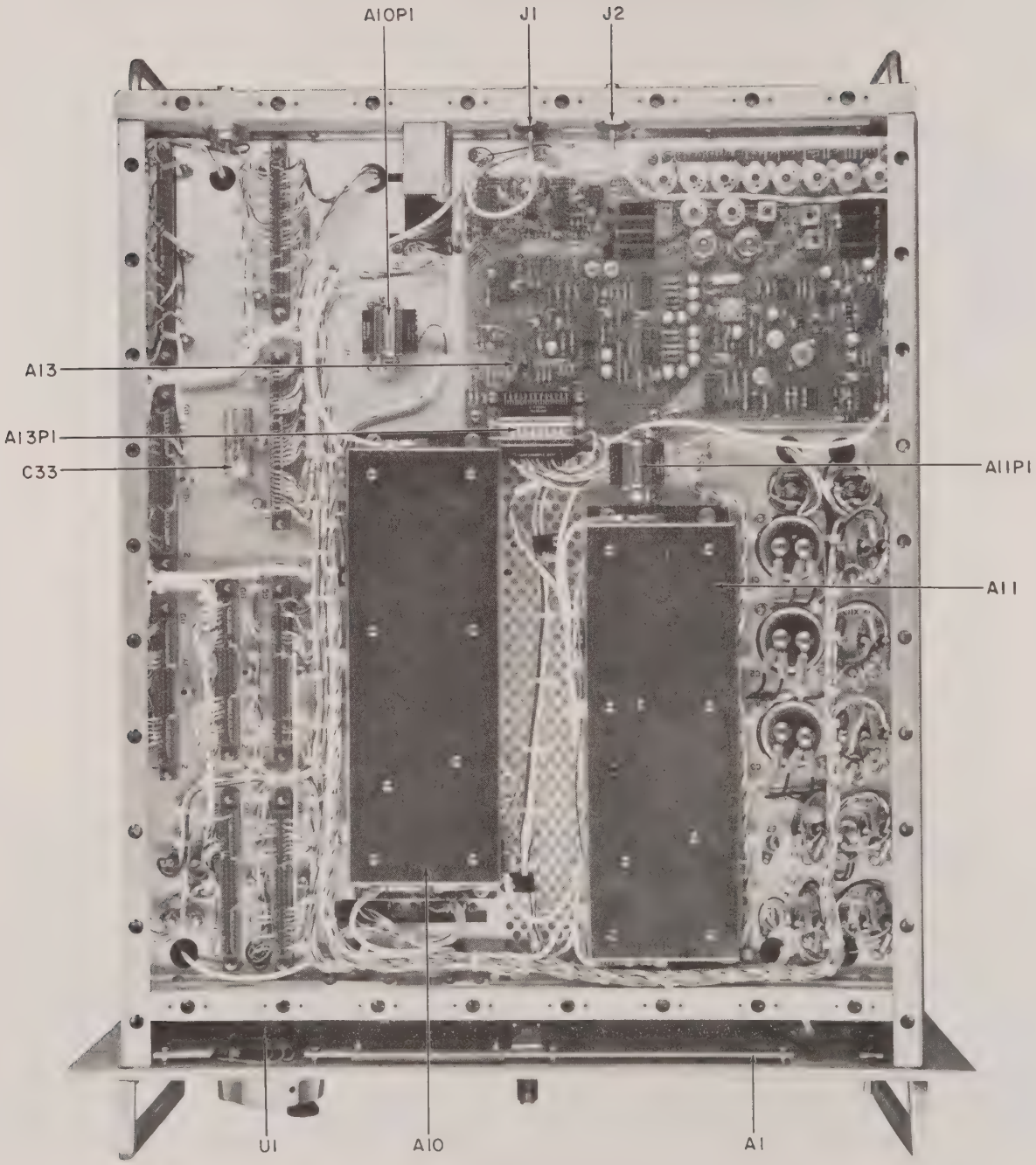


Figure 5-3. WJ-9478 Baseband Receiver Top View, Location of Components

MAIN CHASSIS

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C25	Capacitor, Electrolytic, Aluminum: 3300 µF, 10 Vdc	1	5000338M010GN2	37942	
FL1	Filter, Power	1	1EF1	05245	
J1	Connector, Receptacle	2	225398-7	00779	
J2	Same as J1				
J3 Thru J9	Not Used				
J10	Connector, Receptacle, Filtered	1	1240-030-0000	72982	
J11	Connector, Receptacle	1	57-20240-2	02660	
M1	Not Used				
M2	Meter, Signal Level	1	15691-1	14632	
P1	Connector, Plug	2	1-87456-6	00779	
P2	Same as P1				
P3	Housing, Connector	1	87456-6	00779	
R1	Resistor, Fixed, Film: 200Ω, 1%	2	RN6DD2000F	09021	
R2	Same as R1				
R3	Not Used				
R4	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/4 W	1	CF1/4-1K/J	09021	
S1	Switch, Toggle	1	8280K16	27193	
S2	Switch, Toggle	2	MTA206N	95146	
T1	Transformer Power	1	841160	14632	
U1	Encoder Assembly	1	34836-1	14632	
U2	Voltage Regulator	2	LM340AKC15	27014	
U3	Same as U2				
U4	Voltage Regulator	1	LM120K15	27014	
U5	Voltage Regulator	3	AU7805KC	07263	
U6	Same as U5				
U7	Same as U5				
U8	Voltage Regulator	1	MC7806CK	04713	
U9	Rectifier	2	PK20F	83701	
U10	Same as U9				
XA4	Connector, PC Board	1	250-25-30-170	71785	
XA6 Thru XA8	Connector, PC Board	8	67987-6	00779	

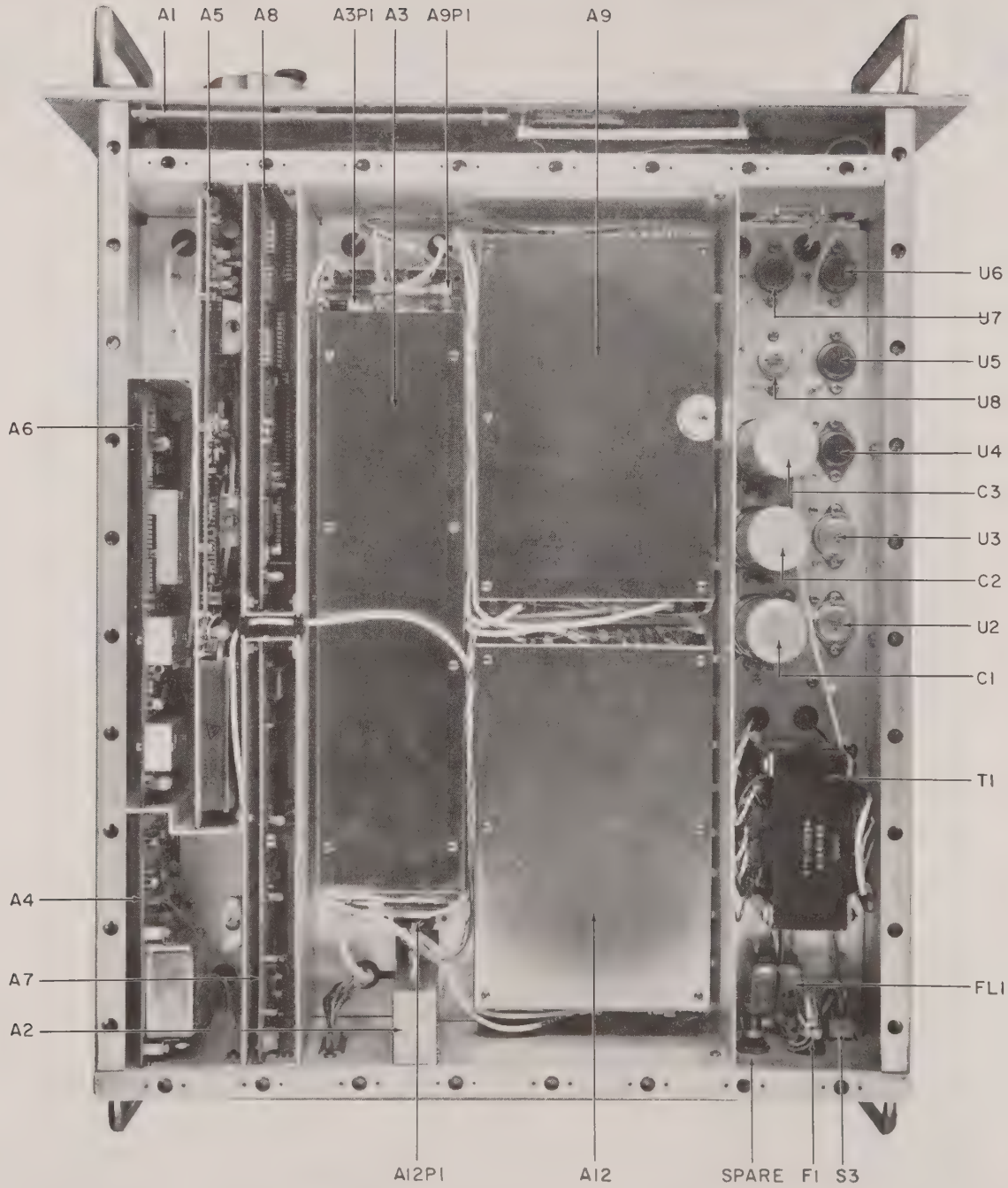


Figure 5-4. WJ-9478 Baseband Receiver Bottom View, Location of Components

5.5.1 TYPE 796273-6 FRONT PANEL DISPLAY

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	Keyboard Assembly	1	796272-5	14632	
C1	Capacitor, Ceramic, Disc: .01 µF, 20%, 50 V	4	34453-1	14632	
C2 Thru C4	Same as C1				
C5	Capacitor, Electrolytic, Tantalum: 47 µF, 20%, 20 V	1	196D476X0020PE4	56289	
CR1	Diode	4	1N914/JAN	81350	
CR2 Thru CR4	Same as CR1				
DS1 Thru DS4	Not Used				
DS5	Diode	18	HLMP-1301	28480	
DS6 Thru DS12	Same as DS5				
DS13	Not Used				
DS14 Thru DS22	Same as DS5				
DS23	Not Used				
DS24	Same as DS5				
DS25	Not Used				
DS26	Not Used				
J1	Connector, Receptacle	3	1-87227-0	00779	
J2	Same as J1				
J3	Same as J1				
J4	Connector, Receptacle	1	87227-5	00779	
R1	Resistor, Fixed, Film: 470 Ω, 5%, 1/4 W	8	CF1/4-470 OHMS/J	09021	
R2 Thru R8	Same as R1				
R9	Resistor, Network	2	899-3-R470	73138	
R10	Same as R9				
R11	Resistor, Fixed, Composition: 10 kΩ, 5%, 1/4 W	3	RCR07G103JS	81349	
R12	Same as R11				
R13	Same as R11				

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R14	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	4	CF1/4-100K/J	09021	
R15 Thru R17	Same as R14				
R18	Resistor, Variable, Composition: 10 kΩ, 10%, 1 W	1	70A3N056L103U	01121	
U1	Integrated Circuit	1	SN74LS138N	01295	
U2	Integrated Circuit	1	SN74LS139N	01295	
U3	Integrated Circuit	2	CD4094BE	02735	
U4	Integrated Circuit	2	SN74LS04N	01295	
U5	Same as U3				
U6	Same as U4				
U7 Thru U11	Not Used				
U12	Display LED	7	END360	07263	
U13 Thru U18	Same as U12				
U19	Integrated Circuit	1	MM74C30N	27014	

5.5.1.1 **Type 796272-5 Keyboard Assembly**

REF DESIG PREFIX A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
DS1	Diode	1	HLMP-1301	28480	
E1	Connector, Paddle Board	1	88213-3	00779	
P1	Connector, Plug, Kit	1	88475-4	00779	
R1	Resistor, Fixed, Film: 470Ω, 5%, 1/4 W	1	CF1/4-470 OHMS/J	09021	
S1	Switch Button Engraving	1	381403-2	14632	
S2	Switch Button Engraving	1	381403-3	14632	
S3	Switch Button Engraving	1	381403-4	14632	
S4	Switch Button Engraving	4	381403-1	14632	
S5	Switch Button Engraving	1	381403-15	14632	
S6	Switch Button Engraving	1	381403-5	14632	
S7	Switch Button Engraving	1	381403-6	14632	
S8	Switch Button Engraving	1	381403-7	14632	
S9	Switch Button Engraving	1	381403-16	14632	
S10	Same as S4				
S11	Switch Button Engraving	1	381403-8	14632	
S12	Switch Button Engraving	1	381403-9	14632	
S13	Switch Button Engraving	1	381403-10	14632	
S14	Switch Button Engraving	1	381403-17	14632	
S15	Switch Button Engraving	1	381403-21	14632	
S16	Switch Button Engraving	1	381403-11	14632	
S17	Switch Button Engraving	1	381403-12	14632	
S18	Same as S4				
S19	Switch Button Engraving	1	381403-18	14632	
S20	Switch Button Engraving	1	381403-22	14632	
S21	Switch Button Engraving	1	381403-13	14632	
S22	Switch Button Engraving	1	381403-14	14632	
S23	Switch Button Engraving	1	381403-19	14632	
S24	Same as S4				
S25	Switch Button Engraving	1	381403-20	14632	
W1	Cable Assembly	1	380065-3	14632	

5.5.2 **TYPE 796659-1 INPUT FILTER ASSEMBLY** REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	Input Filter Assembly	1	381343-1	14632	
J1	Connector, Receptacle	1	UG1094U	80058	
J2	Connector, Receptacle	1	UG1619	80058	

5.5.2.1 **Part 381343-1 Input Filter Assembly** REF DESIG PREFIX A2A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Ceramic, Monolithic: 130 pF, ±2%, 100 V	2	200-100-NPO-131G	51642	
C2	Capacitor, Ceramic, Monolithic: 270 pF, ±2%, 100 V	2	150-100-NPO-271G	51642	
C3	Capacitor, Ceramic, Monolithic: 10 pF, ±2%, 100 V	2	100-100-NPO-100G	51642	
C4	Capacitor, Ceramic, Monolithic: 300 pF, ±2%, 100 V	1	150-100-NPO-301G	51642	
C5	Same as C2				
C6	Same as C3				
C7	Same as C1				
L1	Coil, Toroidal, .561 µH	2	20681-278	14632	
L2	Coil, Toroidal, .673 µH	2	20681-279	14632	
L3	Same as L2				
L4	Same as L1				

5.5.3 TYPE 796650-1 INPUT CONVERTER ASSEMBLY

REF DESIG PREFIX **A3**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	Input Converter Assembly	1	381329-1	14632	
C1	Capacitor, Ceramic, Feedthru: 1000 pF, 20%, 500 V	4	54-794-009-102W	33095	
C2 Thru C4	Same as C1				
J1	Connector, Receptacle	1	1012-1511-000	19505	
J2	Connector, Receptacle	3	1004-7511-002	19505	
J3	Same as J2				
J4	Not Used				
J5	Same as J2				
P1	Connector, Receptacle	1	205206-3	00779	
R1	Resistor, Fixed: 300Ω, 5%, 1/8 W	2	CF1/8-300 OHMS/J	09021	
R2	Resistor, Fixed: 18Ω, 1/8 W	1	CF1/8-18 OHMS/J	09021	
R3	Same as R1				

5.5.3.1 **Part 381329-1 Converter Assembly** REF DESIG PREFIX A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
AT1	Attenuator, Bridged-T: 50Ω, 1/8 W	1	9955-1050	84048	
C1 Thru C9	Not Used				
C10	Capacitor, Ceramic, Monolithic: 1000 pF, ±2%, 100 V	9	150-100-NPO-102G	51642	
C11	Same as C10				
C12	Same as C10				
C13	Capacitor, Ceramic, Chip: .001 µF, 5%, 50 Vdc	4	GRH42-660G-102K50VPB	14632	
C14 Thru C16	Same as C13				
C17	Capacitor, Ceramic, Chip: 47 pF, 5%, 500 V	2	ATC100B470JP500X	29990	
C18	Capacitor, Ceramic, Chip: 100 pF, 20%, 500 V	1	ATC100B101MP500X	29990	
C19	Same as C17				
C20 Thru C22	Same as C10				
C23	Capacitor, Ceramic, Monolithic: 47 pF, ±2%, 100 V	2	150-100-NPO-470G	51642	
C24	Same as C23				
C25	Same as C10				
C26	Capacitor, Ceramic, Monolithic: 180 pF, ±2%, 100V	2	150-100-NPO-181G	51642	
C27	Capacitor, Ceramic, Monolithic: 270 pF, ±2%, 100V	2	150-100-NPO-271G	51642	
C28	Same as C27				
C29	Same as C26				
C30	Same as C10				
C31	Capacitor, Electrolytic, Tantalum: 4.7 µF, 20%, 35 V	2	196D475X0035JE3	56289	
C32	Same as C10				
C33	Capacitor, Ceramic, Monolithic: 130 pF, ±2%, 100 V	2	200-100-NPO-131G	51642	
C34	Capacitor, Ceramic, Monolithic: 100 pF, ±2%, 100 V	2	200-100-NPO-101G	51642	
C35	Capacitor, Ceramic, Monolithic: 5.1 pF, ±0.25 pF, 100 V	1	100-100-NPO-519C	51642	
C36	Same as C34				
C37	Same as C33				
C38	Same as C31				
C39	Capacitor, Ceramic, Disc: .01 µF, 20%, 50 V	1	34453-1	14632	
FB1	Ferrite Bead	10	56-590-65-4A	02114	

REF DESIG PREFIX A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
FB2 Thru FB10	Same as FB1				
FL1	Filter, Bandpass	1	92391	14632	
L1	Coil, Fixed, Molded: 10 µH	2	1025-44 (75084-12)	99800	
L2	Coil, Fixed: 10 µH, 10%	3	1537-36 (14046-4)	99800	
L3	Coil, Fixed, Air: 186 µH	2	28/214-50	14632	
L4	Same as L3				
L5	Same as L2				
L6	Same as L1				
L7	Coil, Fixed: 0.27 µH	1	1025-06 (75083-61)	99800	
L8	Same as L2				
L9	Coil, Fixed: 0.33 µH, 10%	3	1537-04 (18130-3)	99800	
L10	Same as L9				
L11	Same as L9				
L12	Coil, Fixed: 4.7 µH, 10%	1	1537-28 (18130-16)	99800	
L13	Coil, Fixed, Molded: .22 µH, 10%	2	1025-04 (75083-5)	99800	
L14	Coil, Variable: 0.090-0.11 µH	2	558-7107-01	71279	
L15	Same as L14				
L16	Same as L13				
R1	Resistor, Fixed, Film: 430Ω, 5%, 1/4 W	2	CF1/4-430 OHMS/J	09021	
R2	Resistor, Fixed, Film: 12Ω, 5%, 1/4 W	1	CF1/4-12 OHMS/J	09021	
R3	Same as R1				
R4 Thru R14	Not Used				
R15	Resistor, Fixed, Film: 47Ω, 5%, 1/4 W	3	CF1/4-47 OHMS	09021	
R16	Same as R15				
R17	Resistor, Fixed, Film: 100Ω, 5%, 1/4 W	1	CF1/4-100 OHMS/J	09021	
R18	Same as R15				
R19	Resistor, Fixed, Film: 300Ω, 5%, 1/4 W	2	CF1/4-300 OHMS/J	09021	
R20	Resistor, Fixed, Film: 18Ω, 5%, 1/4 W	1	CF1/4-18 OHMS/J	09021	
R21	Same as R19				
T1	Transformer	1	T1-1	15542	

REF DESIG PREFIX **A3A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
U1	Mixer, Balanced	1	TAK-3H	15542	
U2	Not Used				
U3	Attenuator	2	G1	27956	
U4	Amplifier	3	QBH-137	55027	
U5	Same as U4				
U6	Same as U3				
U7	Mixer, Balanced	1	SRA-1H-13	15542	
U8	Same as U4				
U9	Integrated Circuit	1	MWA110	04713	
U10	Integrated Circuit	1	CA2850R	01281	

5.5.4 TYPE 796628-1 REFERENCE GENERATOR ASSEMBLY REF DESIG PREFIX A4

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Electrolytic, Tantalum: 100 µF, 10%, 10 Vdc	1	196D107X0010PE4	56289	
C2	Capacitor, Ceramic, Disc: .1 µF, 20%, 50 V	12	34475-1	14632	
C3	Same as C2				
C4	Capacitor, Ceramic, Monolithic: 75 pF, ±2%, 100 V	2	200-100-NPO-750G	51642	
C5	Capacitor, Ceramic, Monolithic: 390 pF, ±2%, 100 V	2	150-100-NPO-391G	51642	
C6	Capacitor, Variable, Ceramic: 15-60 pF, 200 V	3	538-011F15-60	59660	
C7	Same as C4				
C8 Thru C12	Same as C2				
C13	Capacitor, Electrolytic, Tantalum: 4.7 µF, 20%, 35 V	1	196D475X0035JE3	56289	
C14 Thru C16	Same as C2				
C17	Capacitor, Ceramic, Monolithic: 10 pF, ±2%, 100 V	2	100-100-NPO-100G	51642	
C18	Capacitor, Ceramic, Monolithic: 470 pF, ±2%, 100 V	1	150-100-NPO-471G	51642	
C19	Same as C6				
C20	Same as C17				
C21	Same as C5				
C22	Same as C6				
C23	Same as C2				
C24	Same as C2				
L1	Coil, Toroidal	3	20681-28	14632	
L2	Same as L1				
L3	Same as L1				
L4	Coil, Fixed, Molded: 10 µH	1	1025-44 (75084-12)	99800	
R1	Resistor, Fixed, Film: 100Ω, 5%, 1/4 W	5	CF1/4-100 OHMS/J	09021	
R2	Resistor, Fixed, Film: 1.6 kΩ, 5%, 1/4 W	1	CF1/4-1.6K/J	09021	
R3	Resistor, Fixed, Film: 56Ω, 5%, 1/4 W	2	CF1/4-56 OHMS/J	09021	
R4	Resistor, Fixed, Film: 36Ω, 5%, 1/4 W	1	CF1/4-36 OHMS/J	09021	
R5	Same as R3				
R6	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/4 W	1	CF1/4-1K/J	09021	
R7	Resistor, Fixed, Film: 5.6 kΩ, 5%, 1/4 W	2	CF1/4-5.6K/J	09021	
R8	Same as R7				

REF DESIG PREFIX A4

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R9 Thru R12	Same as R1				
T1	Transformer	1	T9-1	15542	
U1	External Oscillator	1	841150	14632	
U2	Integrated Circuit	1	MM74HC00N	27014	
U3	Integrated Circuit	1	SN75140N	01295	
U4	Integrated Circuit	2	MM74HC04N	27014	
U5	Integrated Circuit	1	MWA110	04713	
U6	Integrated Circuit, Center	1	MM74HC390N	27014	
U7	Same as U4				

5.5.5 TYPE 796453-1 1ST AND 3RD LO SYNTHESIZER REF DESIG PREFIX A5

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	1st LO VCO	1	791629-2	14632	
A2	1st and 3rd LO Synthesizer, Assembly	1	796458-1	14632	
C1	Capacitor, Mica, Dipped: 1600 pF, 2%, 500 V	2	CM06FD162G03	81349	
C2	Capacitor, Ceramic, Disc: 0.47 µF, 20%, 100 V	2	8131M100-651-474M	59660	
C3	Same as C1				
C4	Capacitor, Ceramic, Disc: .05 µF, 20%, 100 V	2	TGS-50	56289	
C5	Capacitor, Electrolytic, Tantalum: 47 µF, 20%, 20 V	2	196D476X0020PE4	56289	
C6	Same as C2				
C7	Same as C5				
C8	Same as C4				
C9	Capacitor, Electrolytic, Tantalum: 2.2 µF, 20%, 35 V	1	196D225X0035JE3	56289	
FB1	Ferrite Bead	17	56-590-65-4A	02114	
FB2 Thru FB17	Same as FB1				
L1	Coil, Fixed: 10 mH, 10%	2	553-3635-49	71279	
L2	Coil, Fixed: 0.82 µH, 10%	1	1537-10 (18130-7)	99800	
L3	Same as L1				
L4	Coil, Fixed: 4.7 mH, 10%	1	553-3635-45	71279	
R1	Resistor, Fixed, Film: 100Ω, 5%, 1/4 W	1	CF1/4-100 OHMS/J	09021	
R2	Resistor, Fixed, Film: 10 kΩ, 1%, 1/10 W	1	RN55C1002F	81349	
R3	Resistor, Fixed, Film: 1.0 kΩ, 1%, 1/10 W	1	RN55C1001F	81349	
R4	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/4 W	1	CF1/4-1K/J	09021	
R5	Resistor, Fixed, Film: 1.82 kΩ, 1%, 1/10 W	1	RN55C1821F	81349	
VR1	Voltage Regulator	1	MC7912CT	04713	

5.5.5.1 **Type 791629-2 1st LO VCO Assembly** REF DESIG PREFIX A5A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	1st LO VCO, Assembly	1	34750	14632	
C1	Capacitor, Ceramic, Feedthru: 1000 pF, 500 V	5	54-794-009-102W	33095	
C2 Thru C4	Same as C1				
C5	Capacitor, Electrolytic, Tantalum: 68 µF, 20%, 15 V	1	183DR686X0015F	56289	
C6	Same as C1				
C7	Capacitor, Ceramic, Disc: .47 µF, 20%, 50 V	1	34452-1	14632	
C8	Capacitor, Ceramic, Disc: 6.8 pF, ±.25 pF, 100 V	1	8101-100-COHO-689C	59660	
P1	Connector, Plug	1	UG1465U	80058	
P2	Connector, Plug	1	UG1466U	80058	
R1	Resistor, Fixed, Film: 1.2 kΩ, 5%, 1/8 W	3	CF1/8-1.2K/J	09021	
R2	Same as R1				
R3	Same as R1				
R4	Resistor, Fixed, Film: 47Ω, 5%, 1/8 W	1	CF1/8-47 OHMS/J	09021	

5.5.5.1.1 **Part 34750 1st LO VCO Assembly** REF DESIG PREFIX A5A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Ceramic, Chip: 200 pF, ±50%, 500 V	10	32-257578-40	91984	
C2 Thru C4	Same as C1				
C5	Capacitor, Ceramic, Chip: 3 pF, 0.25 pF, 500 V	1	603COG3ROC	91984	
C6*	Capacitor, Ceramic, Tubular: 5.6 pF, .25 pF, 500 V	1	301-000COHO-569C	59660	
C7	Capacitor, Composition, Tubular: 2.7 pF, 10%, 500 V	1	QC2.7PFK	95121	
C8	Same as C1				
C9	Capacitor, Composition, Tubular: 1.0 pF, 10%, 500 V	1	QC1.0PFK	95121	
C10	Same as C1				
C11	Capacitor, Ceramic, Disc: .1 µF, 20%, 50 V	1	34475-1	14632	
C12	Same as C1				
C13	Same as C1				
C14	Capacitor, Ceramic, Disc: 470 pF, 10%, 1000 Vdc	7	SP471K	91418	
C15	Capacitor, Mica, Dipped: 100 pF, 2%, 500 V	1	CM04FD101G03	99800	
C16	Same as C1				
C17	Same as C1				
C18	Capacitor, Electrolytic, Tantalum: 2.2 µF, 10%, 20 V	1	CS13BE225K	81349	
C19 Thru C21	Same as C14				
C22	Not Used				
C23	Same as C14				
C24	Not Used				
C25	Same as C14				
C26	Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V	2	CO23B101E502M	56289	
C27	Same as C26				
C28	Capacitor, Ceramic, Tubular: 5.1 pF, .5 pF, 500 V	1	301-000COHO-519D	59660	
C29	Same as C14				
FB1	Ferrite Bead	1	56-590-65-4A	02114	
L1	Coil, Air	1	24592-1	14632	
L2	Coil, Air	2	24593-1	14632	
L3	Same as L2				
L4	Coil, Air	1	24593-2	14632	

REF DESIG PREFIX A5A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
L5	Coil, Fixed: 0.56 µH, 15%	1	202-11	99848	
Q1	Transistor	1	841001-3	14632	
Q2	Transistor	2	2N2857/JAN	81350	
Q3	Same as Q2				
Q4	Transistor	1	2N4918	80131	
Q5	Transistor	1	2N3251	80131	
Q6	Not Used				
Q7	Transistor	1	2N5109	80131	
R1	Resistor, Fixed, Film: 33 kΩ, 5%, 1/8 W	2	CF1/8-33K/J	09021	
R2	Resistor, Fixed, Film: 12 kΩ, 5%, 1/8 W	1	CF1/8-12K/J	09021	
R3	Resistor, Fixed, Film: 22 kΩ, 5%, 1/8 W	1	CF1/8-22K/J	09021	
R4	Resistor, Fixed, Composition: 470Ω, 5%, 1/8 W	4	RCR05G471JS	81349	
R5	Resistor, Fixed, Film: 100 kΩ, 5%, 1/8 W	1	CF1/8-100K/J	09021	
R6	Resistor, Fixed, Film: 8.2 kΩ, 5%, 1/8 W	2	CF1/8-8.2K/J	09021	
R7	Resistor, Fixed, Composition: 5.6 kΩ, 5%, 1/8 W	2	RCR05G562JS	81349	
R8	Resistor, Fixed, Film: 300Ω, 5%, 1/8 W	2	CF1/8-300 OHMS/J	09021	
R9	Resistor, Fixed, Film: 220Ω, 5%, 1/8 W	1	CF1/8-220 OHMS/J	09021	
R10	Resistor, Fixed, Film: 68Ω, 5%, 1/8 W	2	CF1/8-68 OHMS/J	09021	
R11	Resistor, Fixed, Film: 180Ω, 5%, 1/8 W	1	CF1/8-180 OHMS/J	09021	
R12	Same as R10				
R13	Same as R6				
R14	Same as R7				
R15	Resistor, Fixed, Film: 47Ω, 5%, 1/8 W	4	CF1/8-47 OHMS/J	09021	
R16	Same as R8				
R17	Resistor, Fixed, Film: 150Ω, 5%, 1/8 W	1	CF1/8-150 OHMS/J	09021	
R18	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/8 W	2	CF1/8-1.0K/J	09021	
R19	Resistor, Fixed, Film: 390Ω, 5%, 1/8 W	1	CF1/8-390 OHMS/J	09021	
R20	Resistor, Fixed, Film: 10Ω, 5%, 1/4 W	1	CF1/4-10 OHMS/J	09021	
R21	Same as R4				
R22	Same as R4				
R23	Resistor, Fixed, Film: 10Ω, 5%, 1/8 W	1	CF1/8-10 OHMS/J	09021	
R24	Resistor, Fixed, Film: 33Ω, 5%, 1/8 W	1	CF1/8-33 OHMS/J	09021	

REF DESIG PREFIX A5A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R25	Resistor Fixed, Film: 270Ω, 5%, 1/8 W	1	CF1/8-270 OHMS/J	09021	
R26	Same as R15				
R27	Same as R1				
R28	Same as R15				
R29	Resistor, Fixed, Film: 22Ω, 5%, 1/4 W	1	CF1/4-22 OHMS/J	09021	
R30	Same as R15				
R31 Thru R33	Not Used				
R34	Resistor, Fixed, Film: 15Ω, 5%, 1/8 W	1	CF1/8-15 OHMS/J	09021	
R35	Resistor, Fixed, Film: 560Ω, 5%, 1/8 W	1	CF1/8-560 OHMS/J	09021	
R36	Same as R18				
R37	Same as R4				
R38	Not Used				
R39	Not Used				
R40	Resistor, Fixed, Composition: 51Ω, 5%, 1/4 W	1	RCR07G510JS	81349	
T1	Integral Part of Printed Board				
T2	Transformer, Toroidal	2	21278-23	14632	
T3	Same as T2				
T4	Transformer Toroidal	2	21278-27	14632	
T5	Not Used				
T6	Same as T4				
U1	Integrated Circuit, Divider	1	SP8610A	52648	

*Nominal Value, Final Value Factory Selected.

5.5.5.2 Type 796458-1 1st and 3rd LO Synthesizer REF DESIG PREFIX A5A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Mica, Dipped: 47 pF, 2%, 500 V	2	CM04ED470G03	81349	
C2	Same as C1				
C3	Capacitor, Ceramic, Disc: 470 pF, 10%, 1000 Vdc	2	SP471K	91418	
C4 Thru C6	Not Used				
C7	Capacitor, Ceramic, Disc: .01 µF, 20%, 50 V	12	34453-1	14632	
C8 Thru C15	Same as C7				
C16	Capacitor, Electrolytic, Tantalum: 22 µF, 20%, 15 V	4	196D226X0015KE3	56289	
C17	Same as C3				
C18	Capacitor, Fixed, Plastic: 4700 pF, 10%, 100 V	1	WMF1D47	14655	
C19	Not Used				
C20	Capacitor, Ceramic, Disc: .1 µF, 20%, 50 V	2	34475-1	14632	
C21 Thru C24	Not Used				
C25	Same as C16				
C26	Capacitor, Electrolytic, Tantalum: 27 µF, 10%, 35 V	2	196D276X9035TE4	56289	
C27	Not Used				
C28	Not Used				
C29	Capacitor, Electrolytic, Tantalum: 100 µF, 10%, 10 Vdc	1	196D107X0010PE4	56289	
C30	Same as C7				
C31	Same as C16				
C32	Same as C20				
C33	Capacitor, Variable, Ceramic: 2-8 pF, 350 V	1	538-006A2-8	59660	
C34	Capacitor, Mica, Dipped: 100 pF, 2%, 500 V	2	CM05FD101G03	81349	
C35	Same as C34				
C36	Same as C7				
C37	Same as C7				
C38	Same as C16				
C39	Same as C26				
C40 Thru C42	Not Used				

REF DESIG PREFIX A5A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C43*	Capacitor, Mica, Dipped: 22 pF, 5%, 500 V	1	CM04ED220J03	81349	
C44	Capacitor, Mica, Dipped: 330 pF, 2%, 500 V	1	CM05FD331G03	81349	
C45	Capacitor, Electrolytic, Tantalum: 22 µF, 20%, 10 V	1	196D226X0010JE3	56289	
C46	Capacitor, Ceramic, Disc: 1000 pF, 500 V	1	B-GP1000PFP	91418	
C47	Capacitor, Mica, Dipped: 27 pF, 2%, 500 V	1	CM04ED270G03	81349	
CR1	Diode	4	5082-2800	28480	
CR2	Same as CR1				
CR3	Same as CR1				
CR4	Diode	1	HLMP-1301	18480	
CR5	Not Used				
CR6	Not Used				
CR7	Diode	1	U11-3102	52673	
CR8	Diode	3	1N965B	80131	
CR9	Same as CR8				
CR10	Same as CR8				
CR11	Same as CR1				
CR12	Diode	1	5082-3188	28480	
CR13	Diode	1	1N4449	80131	
CR14	Diode	1	1N462A	80131	
J1	Connector, Receptacle	1	50-053-0000	98291	
J2	Connector, Receptacle	1	1009-7511-000	19505	
L1	Coil, Fixed: 0.24 µH, 15%	1	200-11	99848	
L2	Not Used				
L3	Coil, Fixed: 100 µH, 10%	1	553-3635-25	71279	
Q1	Not Used				
Q2	Transistor	3	2N4401	80131	
Q3	Same as Q2				
Q4	Same as Q2				
Q5	Transistor	1	2N2369A	80131	
Q6	Not Used				
Q7	Not Used				
Q8	Transistor	2	2N706	80131	
Q9	Same as Q8				
Q10	Transistor	1	2N706	80131	

REF DESIG PREFIX A5A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R1	Resistor, Fixed, Film: 100Ω, 5%, 1/4 W	5	CF1/4-100 OHMS/J	09021	
R2	Resistor, Fixed, Film: 470Ω, 5%, 1/4 W	3	CF1/4-470 OHMS/J	09021	
R3	Same as R2				
R4	Resistor, Fixed, Film: 82 kΩ, 5%, 1/8 W	4	CF1/8-82K/J	09021	
R5	Same as R4				
R6	Resistor, Fixed, Film: 5.6 kΩ, 5%, 1/4 W	2	CF1/4-5.6K/J	09021	
R7	Same as R6				
R8	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	1	CF1/4-100K/J	09021	
R9 Thru R12	Same as R1				
R13	Resistor, Fixed, Film: 100Ω, 5%, 1/8 W	10	CF1/8-100 OHMS/J	09021	
R14 Thru R22	Same as R13				
R23	Resistor, Fixed, Film: 2.2 kΩ, 5%, 1/4 W	3	CF1/4-2.2K/J	09021	
R24	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	8	CF1/4-10K/J	09021	
R25	Same as R4				
R26	Resistor, Fixed, Film: 20 kΩ, 5%, 1/4 W	3	CF1/4-20K/J	09021	
R27	Same as R23				
R28	Same as R24				
R29	Same as R26				
R30	Same as R23				
R31	Same as R24				
R32	Same as R26				
R33	Same as R4				
R36	Resistor, Fixed, Film: 27 kΩ, 5%, 1/8 W	3	CF1/8-27K/J	09021	
R37	Same as R36				
R38 Thru R44	Not Used				
R45	Same as R36				
R46	Resistor, Fixed, Film: 270Ω, 5%, 1/4 W	3	CF1/4-270 OHMS/J	09021	
R47	Not Used				
R48	Same as R24				

REF DESIG PREFIX **A5A2**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R49	Resistor, Fixed, Film: 24 kΩ, 5%, 1/4 W	1	CF1/4-24K/J	09021	
R50	Same as R24				
R51	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/4 W	8	CF1/4-1K/J	09021	
R52	Same as R51				
R53	Same as R24				
R54	Resistor, Fixed, Film: 22Ω, 5%, 1/4 W	3	CF1/4-22 OHMS/J	09021	
R55	Resistor, Fixed, Film: 27Ω, 5%, 1/4 W	1	CF1/4-27 OHMS/J	09021	
R56	Same as R46				
R57	Same as R54				
R58	Resistor, Fixed, Film: 150Ω, 5%, 1/4 W	2	CF1/4-150 OHMS/J	09021	
R59	Same as R58				
R60	Not Used				
R61	Same as R24				
R62	Not Used				
R63	Resistor, Fixed, Film: 220Ω, 5%, 1/4 W	1	CF1/4-220 OHMS/J	09021	
R64	Resistor, Fixed, Composition: 22Ω, 5%, 1/2 W	1	RCR20G220JS	81349	
R65 Thru R68	Same as R51				
R69	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/8 W	5	CF1/8-1.0K/J	09021	
R70 Thru R72	Same as R69				
R73	Same as R24				
R74	Same as R2				
R77	Same as R54				
R78	Resistor, Fixed, Film: 47 kΩ, 5%, 1/8 W	2	CF1/8-47K/J	09021	
R79	Same as R78				
R80	Same as R51				
R81	Same as R51				
R86	Same as R46				
R87	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1/8 W	1	CF1/8-4.7K/J	09021	
R88	Same as R69				
U1	Integrated Circuit	1	MC12013L	04713	

REF DESIG PREFIX A5A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
U2	Integrated Circuit	1	SN74S196J	01295	
U3	Integrated Circuit	1	MC12014L	04713	
U4	Integrated Circuit	1	841013	14632	
U5	Integrated Circuit	2	MC4044P	04713	
U6	Integrated Circuit	1	867400	14632	
U7	Integrated Circuit	1	CA6741T	02735	
U8	Integrated Circuit	2	SN74LS190N	01295	
U9	Integrated Circuit	5	SN74LS196N	01295	
U10	Same as U8				
U11	Integrated Circuit	1	SN74LS191N	01295	
U12	Integrated Circuit	1	SN74S74N	01295	
U13	Integrated Circuit	1	SN74184N	01295	
U15 Thru U19	Same as U9				
U20	Not Used				
U21	Integrated Circuit	1	SN74LS74N	01295	
U22	Same as U5				
U24	Integrated Circuit	1	SN74LS02N	01295	
VR1	Voltage Regulator	1	UA78M05HC	07263	
Y1	Crystal, Quartz	1	91805-39	14632	

5.5.6 TYPE 796266-1 2ND LO SYNTHESIZER

REF DESIG PREFIX A6

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Ceramic, Disc: .47 µF, 20%, 50 V	3	34452-1	14632	
C2	Same as C1				
C3	Capacitor, Electrolytic, Tantalum: 47 µF, 20%, 20 V	3	196D476X0020PE4	56289	
C4	Capacitor, Electrolytic, Tantalum: 220 µF, 20%, 10 V	5	196D227X0010TE4	56289	
C5	Capacitor, Electrolytic, Tantalum: 1 µF, 20%, 35 V	2	196D105X0035HE3	56289	
C6	Capacitor, Ceramic, Disc: 2200 pF, 10%, 200 V	1	CK06BX222K	81349	
C7	Capacitor, Electrolytic, Tantalum: 22 µF, 20%, 10 V	3	196D226X0010JE3	56289	
C8	Same as C3				
C9	Capacitor, Mica, Dipped: 1000 pF, 2%, 500 V	2	CM06FD102G03	81349	
C10	Capacitor, Ceramic, Disc: .1 µF, 20%, 50 V	2	34475-1	14632	
C11	Capacitor, Ceramic, Disc: .01 µF, 20%, 50 V	16	34453-1	14632	
C12	Same as C11				
C13	Same as C10				
C14	Capacitor, Electrolytic, Tantalum: 22 µF, 20%, 35 V	2	196D226X0035PE4	56289	
C15	Same as C7				
C16	Capacitor, Ceramic, Disc: 470 pF, 10%, 1000 Vdc	3	SP471K	91418	
C17	Capacitor, Electrolytic, Tantalum: 150 µF, 20%, 6 V	1	196D157X0006PE4	56289	
C18	Same as C5				
C19	Same as C11				
C20	Same as C11				
C21	Capacitor, Composition, Tubular: 2.0 pF, 10%, 500 V	1	QC2.0 PFK	95121	
C22	Capacitor, Ceramic, Tubular: 5.1 pF, .5 pF, 500 V	1	301-000COHO-519D	59660	
C23	Capacitor, Mica, Dipped: 110 pF, 2%, 500 V	1	CM05FD111G03	81349	
C24	Same as C11				
C25	Same as C3				
C26 Thru C28	Same as C4				
C29	Capacitor, Plastic, Tubular: .022 µF, 5%, 100 V	1	663UW223-5-1W	84411	
C30	Capacitor, Fixed, Plastic: 4700 pF, 10%, 100 V	1	WMF1D47	14655	
C31	Same as C9				
C32	Same as C7				

REF DESIG PREFIX A6

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C33	Same as C16				
C34	Same as C16				
C35	Same as C11				
C36	Capacitor, Ceramic, Disc: 1000 pF, 500 V	7	B-GP1000 PFP	91418	
C37	Same as C14				
C38	Same as C36				
C39	Same as C36				
C40	Same as C11				
C41	Same as C36				
C42 Thru C49	Same as C11				
C50	Capacitor, Ceramic, Tubular: 22 pF, 5%, 500 V	6	301-000COGO-220J	59660	
C51	Capacitor, Variable, Air: .4-2.5 pF, 500 V	2	27283	91293	
C52	Capacitor, Ceramic, Tubular: 6.8 pF, .25 pF, 500 V	2	301-000COHO-689C	59660	
C53	Same as C50				
C54	Same as C50				
C55	Same as C36				
C56	Capacitor, Ceramic, Tubular: 1.0 pF, .25 pF, 500 V	2	301-000COKO-109C	59660	
C57	Capacitor, Ceramic, Tubular: 2.2 pF, .25 pF, 500 V	1	301-000COJO-229C	59660	
C58	Same as C11				
C59	Capacitor, Ceramic, Tubular: 15 pF, 5%, 500 V	1	301-000COGO-150J	59660	
C60	Same as C50				
C61	Same as C51				
C62	Same as C52				
C63	Same as C50				
C64	Same as C50				
C65	Same as C36				
C66	Same as C56				
C67	Capacitor, Ceramic, Tubular: 3.9 pF, 0.25 pF, 500 V	1	301-000T2JO-399C	59660	
C68	Capacitor, Mica, Dipped: 150 pF, 2%, 500 V	1	CM05FD151G03	81349	
C69	Capacitor, Ceramic, Tubular: 4.7 pF, .1 pF, 500 V	1	301-000COHO-479B	59660	
C70	Capacitor, Ceramic, Tubular: 2.2 pF, .25 pF, 500 V	1	301-000COJO-229C	59660	

REF DESIG PREFIX A6

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C71	Capacitor, Ceramic, Tubular: 15 pF, 5%, 500 V	1	301-000COGO-150J	59660	
C72	Capacitor, Mica, Dipped: 1000 pF, 5%, 100 V	1	DM15-102J	72136	
C73	Same as C36				
C74	Same as C1				
C75	Capacitor, Mica, Dipped: 100 pF, 2%, 500 V	1	CM04FD101G03	99800	
C76	Same as C4				
CR1	Diode	2	HLMP-1301	28480	
CR2	Diode	1	1N4446	80131	
CR3	Diode	2	U11-3102	52673	
CR4	Same as CR3				
CR5	Diode, Varicap	1	KV3901	52673	
CR6	Same as CR1				
FB1	Ferrite Bead	2	P5-1288	01037	
FB2	Same as FB1				
J1	Connector, Receptacle	1	1009-7511-000	19505	
L1	Coil, Fixed, Molded: .47 µH, 10%	1	1537-06 (18130-4)	99800	
L2	Coil, Fixed: 0.68 µH, 10%	1	1537-08 (18130-6)	99800	
L3	Not Used				
L4	Coil, Fixed: 22 mH, 10%	1	553-3635-53	71279	
L5	Not Used				
L6	Coil, Fixed: 0.33 µH, 10%	2	1537-04 (18130-3)	99800	
L7	Same as L6				
L8	Inductor	1	21210-183	14632	
L9	Coil, Fixed, Molded: 1.8 µH, 10%	1	1537-18 (18130-011)	99800	
L10	Coil, Fixed: 10 µH, 10%	1	553-3635-13	71279	
L11	Coil, Fixed: 100 µH, 5%	1	1537-76 (90538-12)	99800	
Q1	Transistor	3	2N2857/JAN	81350	
Q2	Transistor	1	2N2222A	80131	
Q3	Transistor	1	841001-1	14632	
Q4	Not Used				
Q5	Same as Q1				
Q6	Same as Q1				

REF DESIG PREFIX A6

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R2	Same as R1				
R3	Same as R1				
R4	Resistor, Fixed, Film: 1.8 kΩ, 5%, 1/4 W	1	CF1/4-1.8K/J	09021	
R5	Resistor, Fixed, Film: 100Ω, 5%, 1/4 W	3	CF1/4-100 OHMS/J	09021	
R6	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/4 W	11	CF1/4-1K/J	09021	
R7	Resistor, Fixed, Film: 1.2 kΩ, 5%, 1/4 W	1	CF1/4-1.2K/J	09021	
R8	Resistor, Fixed, Film: 10Ω, 5%, 1/4 W	4	CF1/4-10 OHMS/J	09021	
R9	Same as R6				
R10	Resistor, Fixed, Composition: 5.6Ω, 5%, 1/4 W	1	RCR07G5R6JS	81349	
R11	Resistor, Fixed, Composition: 5.1 kΩ, 5%, 1/4 W	1	RCR07G512JS	81349	
R12	Same as R6				
R13	Same as R8				
R14	Same as R6				
R15	Resistor, Fixed, Film: 47Ω, 5%, 1/4 W	6	CF1/4-47 OHMS/J	09021	
R16	Same as R15				
R17	Same as R15				
R18	Not Used				
R19	Resistor, Fixed, Film: 820Ω, 5%, 1/4 W	1	CF1/4-820 OHMS/J	09021	
R20	Resistor, Fixed, Film: 2.2 kΩ, 5%, 1/4 W	2	CF1/4-2.2K/J	09021	
R21	Same as R20				
R22	Resistor, Fixed, Film: 100Ω, 5%, 1/4 W	1	CF1/4-100 OHMS/J	09021	
R23	Resistor, Fixed, Film: 18 kΩ, 5%, 1/4 W	1	CF1/4-18K/J	09021	
R24	Not Used				
R25	Same as R6				
R26	Same as R5				
R27	Resistor, Fixed, Film: 2.7 kΩ, 5%, 1/4 W	2	CF1/4-2.7K/J	09021	
R28	Same as R5				
Q7	Transistor	1	U310	17856	
R1	Resistor, Fixed, Film: 22Ω, 5%, 1/4 W	4	CF1/4-22 OHMS/J	09021	
R29	Same as R6				
R30	Resistor, Fixed, Film: 270Ω, 5%, 1/4 W	1	CF1/4-270 OHMS/J	09021	
R31	Resistor, Fixed, Film: 1.0M, 5%, 1/4 W	1	CF1/4-1 M/J	09021	

REF DESIG PREFIX A6

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R32	Resistor, Fixed, Film: 820 kΩ, 5%, 1/4 W	1	CF1/4-820K/J	09021	
R33	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	1	CF1/4-100K/J	09021	
R34	Resistor, Fixed, Film: 360Ω, 5%, 1/4 W	1	CF1/4-360 OHMS/J	09021	
R35	Same as R27				
R36	Same as R8				
R37	Resistor, Fixed, Film: 4.7Ω, 5%, 1/4 W	2	CF1/4-4.7 OHMS/J	09021	
R38	Same as R8				
R39	Resistor, Fixed, Film: 56Ω, 5%, 1/4 W	1	CF1/4-56 OHMS/J	09021	
R40	Resistor, Fixed, Film: 470Ω, 5%, 1/4 W	5	CF1/4-470 OHMS/J	09021	
R41	Same as R6				
R42	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	4	CF1/4-10K/J	09021	
R43	Not Used				
R44	Resistor, Fixed, Film: 47 kΩ, 5%, 1/4 W	1	CF1/4-47K/J	09021	
R45	Not Used				
R46	Resistor, Fixed, Film: 1.5 kΩ, 5%, 1/4 W	1	CF1/4-1.5K/J	09021	
R47	Resistor, Fixed, Film: 750Ω, 5%, 1/4 W	1	CF1/4-750 OHMS/J	09021	
R48	Same as R15				
R49	Same as R15				
R50	Same as R40				
R51	Same as R40				
R52	Same as R6				
R53	Same as R6				
R54	Same as R40				
R55	Same as R40				
R56 Thru R58	Not Used				
R59	Same as R37				
R60	Same as R6				
R61	Not Used				
R62	Same as R42				
R63	Same as R42				
R64	Resistor, Fixed, Film: 10 kΩ, 5%, 1/8 W	3	CF1/8-10K/J	09021	

REF DESIG PREFIX A6

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R65	Resistor, Fixed, Film: 18.2 kΩ, 1%, 1/10 W	4	RN55C1822F	81349	
R66	Same as R65				
R67	Resistor, Fixed, Film: 22Ω, 5%, 1/8 W	2	CF1/8-22 OHMS/J	09021	
R68	Resistor, Fixed, Film: 2.74 kΩ, 1%, 1/10 W	1	RN55C2741F	81349	
R69	Same as R64				
R70	Same as R65				
R71	Same as R65				
R72	Same as R67				
R73	Resistor, Fixed, Film: 3.92 kΩ, 1%, 1/10 W	1	RN55C3921F	81349	
R74	Resistor, Fixed, Film: 220Ω, 5%, 1/4 W	1	CF1/4-220 OHMS/J	09021	
R75	Same as R1				
R76	Same as R64				
R77	Not Used				
R78	Same as R15				
R79	Same as R42				
R80	Same as R6				
R81	Resistor, Fixed, Film: 220 kΩ, 5%, 1/8 W	1	CF1/8-220K/J	09021	
U1	Integrated Circuit	3	MC4044P	04713	
U2	Integrated Circuit	1	SN74177N	01295	
U3	Integrated Circuit	1	SN74S74N	01295	
U4	Integrated Circuit	1	796HC	07263	
U5	Integrated Circuit	1	N5733K	18324	
U6	Same as U1				

REF DESIG PREFIX A6

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
U7	Integrated Circuit	1	SN74LS190N	01295	
U8	Integrated Circuit	3	SN74LS191N	01295	
U9	Same as U8				
U10	Same as U8				
U11	Integrated Circuit	2	SN74LS00N	01295	
U12	Same as U1				
U13	Not Used				
U14	Integrated Circuit	1	SN74LS168N	01295	
U15	Integrated Circuit	2	MC12013P	04713	
U16	Same as U15				
U17	Integrated Circuit	2	SN74LS196N	01295	
U18	Not Used				
U19	Same as U17				
U20	Same as U11				
U21	Integrated Circuit	1	MWA120	04713	
VR1	Diode	1	1N756A	80131	

*Nominal Value, Final Value Factory Selected

5.5.7 TYPE 796282-2 I/O INTERFACE ASSEMBLY — REF DESIG PREFIX A7

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Electrolytic, Tantalum: 22 µF, 20%, 15 V	2	196D226X0015KE3	56289	
C2	Capacitor, Ceramic, Disc: .1 µF, 20%, 50 V	4	34475-1	14632	
C3	Same as C1				
C4	Same as C2				
C5	Same as C2				
C6	Capacitor, Electrolytic, Tantalum: 100 µF, 10%, 10 Vdc	1	196D107X0010PE4	56289	
C7	Capacitor, Electrolytic, Tantalum: 47 µF, 20%, 20 V	2	196D476X0020PE4	56289	
C8	Same as C7				
C9	Same as C2				
C10	Capacitor, Electrolytic, Tantalum: 2.2 µF, 20%, 35 V	1	196D22X0035JE3	56289	
LS1	Alarm, Miniature	1	PKM11-4A0	51406	
L1	Coil, Fixed: 100 mH, 10%	1	553-3635-61	71279	
Q1	Transistor	1	2N2222A	80131	
R1	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	1	CF1/4-10K/J	09021	
R2	Resistor, Fixed, Film: 22 kΩ, 2%, 1/4 W	1	CF1/4-22K/J	09021	
R3	Resistor, Fixed, Film: 100Ω, 5%, 1/4 W	2	CF1/4-100 OHMS/J	09021	
R4	Resistor, Fixed, Film: 562Ω, 1%, 1/10 W	4	RN55C5620F	81349	
R5 Thru R7	Same as R4				
R8	Same as R3				
R9	Resistor, Fixed, Film: 3.3 kΩ, 5%, 1/4 W	5	CF1/4-3.3K/J	09021	
R10 Thru R13	Same as R9				
R14	Resistor, Fixed, Film: 6.8 kΩ, 5%, 1/4 W	1	CF1/4-6.8K/J	09021	
S1	Switch, Dip	1	76PSB05	81073	
U1	Integrated Circuit	2	MD74SC138AC	36665	
U2	Integrated Circuit	7	MM74C374N	27014	
U3 Thru U8	Same as U2				
U9	Integrated Circuit	1	AD7528JN	24355	
U10	Integrated Circuit	1	MC1458N	18324	
U11	Integrated Circuit	1	MM80C97N	27014	

REF DESIG PREFIX A7

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
U12	Integrated Circuit	1	P8291A	34649	
U13	Integrated Circuit	2	MC3447L	04713	
U14	Same as U13				
U15	Same as U1				
U16	Voltage Regulator	1	79M05AHC	07263	

5.5.8 TYPE 796623-5 MICROPROCESSOR CONTROL REF DESIG PREFIX A8

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
BT1	Battery	1	41B901CD18-1	19209	
C1	Not Used				
C2	Capacitor, Mica, Dipped: 22 pF, 5%, 500 V	1	CM04ED220J03	81349	
C3	Capacitor, Ceramic, Disc: .1 µF, 20%, 50 V	6	34475-1	14632	
C4	Capacitor, Mica, Dipped: 470 pF, 2%, 500 V	2	DM15-471G	72136	
C5	Same as C4				
C6	Capacitor, Electrolytic, Tantalum: 4.7 µF, 20%, 35 V	2	196D475X0035JE3	56289	
C7	Capacitor, Electrolytic, Tantalum: 220 µF, 20%, 10 V	1	196D227X0010TE4	56289	
C8	Same as C3				
C9	Capacitor, Ceramic, Disc: 1 µF, 20%, 50 V	1	8131-050-651-105M	59660	
C10	Same as C3				
C11	Same as C6				
C12	Capacitor, Ceramic, Disc: .01 µF, 20%, 50 V	3	34453-1	14632	
C13	Same as C12				
C14	Same as C12				
C15	Same as C3				
C16	Capacitor, Micro-Q, Dip: .03 µF, 50 V	2	Q-20.03	31745	
C17	Same as C16				
C18	Capacitor, Micro-Q, Dip: .03 µF, 50 V	5	Q-16.03	31745	
C19	Same as C18				
C20	Same as C3				
C21	Capacitor, Micro-Q, Dip: .02 µF, 50 V	6	Q-14.02	31745	
C22	Same as C21				
C23	Same as C3				
C24	Same as C21				
C25	Same as C18				
C26	Same as C18				
C27	Same as C21				
C28	Not Used				
C29	Same as C18				
C30	Same as C21				
C31	Same as C21				
CR1	Diode	3	1N4449	80131	

REF DESIG PREFIX A8

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
CR2	Same as CR1				
CR3	Same as CR1				
Q1	Transistor	1	2N3251	80131	
Q2	Transistor		2N2222A	80131	
R1	Resistor, Fixed, Film: 22 kΩ, 5%, 1/4 W	1	CF1/4-22K/J	09021	
R2	Resistor, Fixed, Film: 220 kΩ, 5%, 1/4 W	4	CF1/4-220K/J	09021	
R3	Resistor, Fixed, Film: 2.2M, 5%, 1/4 W	1	CF1/4-2.2M/J	09021	
R4 Thru R6	Same as R2				
R7	Resistor, Fixed, Film: 2.2 kΩ, 5%, 1/4 W	1	CF1/4-2.2K/J	09021	
R8	Resistor, Fixed, Film: 100Ω, 5%, 1/4 W	1	CF1/4-100 OHMS/J	09021	
R9	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/4 W	2	CF1/4-1K/J	09021	
R10	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	6	CF1/4-10K/J	09021	
R11	Same as R10				
R12	Same as R10				
R13	Resistor, Fixed, Film: 220Ω, 5%, 1/4 W	1	CF1/4-220 OHMS/J	09021	
R14	Resistor, Fixed, Film: 6.8 kΩ, 5%, 1/4 W	1	CF1/4-6.8K/J	09021	
R15 Thru R17	Same as R10				
U1	Integrated Circuit	1	P8085A	34649	
U2	Integrated Circuit	1	MM74HC373N	27014	
U3	Integrated Circuit	1	MM74HC245N	27014	
U4	Integrated Circuit	2	MM74HC138N	27014	
U5	Integrated Circuit	1	CD4049AE	02735	
U6	Integrated Circuit	1	HM6116LP-4	62786	
U7	EPROM, Programmed	1	841231	14632	
U8	Integrated Circuit	1	SN74LS290N	01295	
U9	Integrated Circuit	1	P8253	34649	
U10	Integrated Circuit	1	ADC0808CCN	27014	
U11	Integrated Circuit	1	MM74C02N	27014	
U12	Integrated Circuit	2	MM74C74N	27014	
U13	Same as U12				
U14	Integrated Circuit	2	MM80C97N	27014	
U15	Same as U14				

REF DESIG PREFIX A8

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
U16	Integrated Circuit	1	MC14572UBCP	02735	
U17	Same as U4				
U18	Integrated Circuit	1	MM74C922N	27014	
U19	Integrated Circuit	1	ICM7218CIJI	32293	
U20	Integrated, Buffer	1	MM74HC14N	27014	
U21	Integrated Circuit	1	MM74HC08N	27014	
VR1	Diode	1	1N753A	80131	
VR2	Diode	1	1N751A	80131	
Y1	Crystal Quartz	1	91805-29	14632	

5.5.9 TYPE 796649-1 IF SELECTOR ASSEMBLY

REF DESIG PREFIX A9

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	IF Selector Assembly	1	381312-1	14632	
C1	Capacitor, Ceramic, Feedthru: 1000 pF, 500 V	7	54-794-009-102W	33095	
C2 Thru C7	Same as C1				
J1	Connector, Receptacle	2	1012-1511-000	19505	
J2	Same as J1				
P1	Connector, Receptacle	1	205206-3	00779	

5.5.9.1 **Part 381312-1 Selector Assembly** REF DESIG PREFIX A9A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
AT1	Attenuator, Bridget-T: 50Ω, ±20%	4	9955-1050	84048	
AT2 Thru AT4	Same as AT1				
C1	Capacitor, Ceramic, Disc: .01 µF, 20%, 50 V	29	34453-1	14632	
C2 Thru C5	Same as C1				
C6	Capacitor, Electrolytic, Tantalum: 4.7 µF, 20%, 35 V	5	196D475X0035JE3	56289	
C7 Thru C31	Same as C1				
C32	Same as C6				
C33	Same as C1				
C34	Same as C1				
C35	Capacitor, Ceramic, Disc: .1 µF, 20%, 50 V	2	34475-1	14632	
C36	Same as C35				
CR1	Diode	2	1N4449	80131	
CR2	Same as CR1				
CR3	Diode	12	5082-3188	28480	
CR4 Thru CR14	Same as CR3				
FL1	Filter	1	92392	14632	
FL2	Filter	1	92393	14632	
FL3	Filter	1	92395	14632	
FL4	Filter	1	92394	14632	
L1	Coil, Fixed: 47 µH, 10%	3	1025-60 (75085-3)	99800	
L2	Same as L1				
L3	Coil, Fixed: 47 µH, 5%	1	1537-60 (90538-04)	99800	
L4	Same as L1				
R1	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	5	CF1/4-10K/J	09021	
R2 Thru R5	Same as R1				
R6	Resistor, Fixed, Film: 12 kΩ, 5%, 1/4 W	1	CF1/4-12K/J	09021	
R7	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	1	CF1/4-100K/J	09021	

REF DESIG PREFIX A9A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R8	Resistor, Fixed, Film: 2.2 kΩ, 5%, 1/4 W	1	CF1/4-2.2K/J	09021	
R9	Resistor, Fixed, Film: 10Ω, 5%, 1/4 W	5	CF1/4-10 OHMS/J	09021	
R10 Thru R12	Same as R9				
R13	Resistor, Fixed, Film: 470Ω, 5%, 1/4 W	8	CF1/4-470 OHMS/J	09021	
R14	Resistor, Fixed, Film: 1.8 kΩ, 5%, 1/4 W	8	CF1/4-1.8K/J	09021	
R15	Same as R13				
R16	Same as R14				
R17	Same as R13				
R18	Same as R14				
R19	Same as R13				
R20	Same as R14				
R21	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/4 W	2	CF1/4-1K/J	09021	
R22	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1/4 W	4	CF1/4-4.7K/J	09021	
R23 Thru R25	Same as R22				
R26	Same as R14				
R27	Same as R13				
R28	Same as R14				
R29	Same as R13				
R30	Same as R14				
R31	Same as R13				
R32	Same as R14				
R33	Same as R13				
R34	Same as R21				
R35	Same as R9				
U1	Integrated Circuit	2	MC3403P	04713	
U2	Same as U1				
U3	Amplifier	1	QBH-137	55027	
Z1	Balun Transformer	1	281179-1	14632	

5.5.10 TYPE 796651-1 THIRD CONVERTER ASSEMBLY REF DESIG PREFIX A10

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	Third Converter Assembly	1	381332-1	14632	
C1	Capacitor, Ceramic, Feedthru: 1000 pF, 20%, 500 V	5	54-794-009-102W	33095	
C2 Thru C5	Same as C1				
J1	Connector, Receptacle	4	1012-1511-000	19505	
J2 Thru J4	Same as J1				
L1	Coil, Fixed: 47 µH, 10%	1	1025-60	99800	
P1	Connector, Receptacle	1	205206-3	00779	

5.5.10.1 **Part 381332-1 Third Converter Assembly** REF DESIG PREFIX **A10A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Electrolytic, Tantalum: 4.7 µF, 20%, 35 V	7	196D475X0035JE3	56289	
C2	Capacitor, Ceramic, Disc: .01 µF, 20%, 50 V	9	34453-1	14632	
C3	Same as C2				
C4	Same as C2				
C5	Capacitor, Ceramic, Monolithic: 180 pF, ±2%, 100 V	6	150-100-NPO-181G	51642	
C6	Capacitor, Ceramic, Monolithic: 270 pF, ±2%, 100 V	6	150-100-NPO-271G	51642	
C7	Same as C6				
C8	Same as C5				
C9	Same as C2				
C10	Same as C5				
C11	Same as C6				
C12	Same as C6				
C13	Same as C5				
C14	Same as C2				
C15	Capacitor, Electrolytic, Tantalum: 47 µF, 20%, 35 V	1	196D476X0035TE4	56289	
C16	Same as C2				
C17	Same as C2				
C18	Same as C1				
C19	Same as C2				
C20	Same as C2				
C21	Capacitor, Ceramic, Monolithic: 4700 pF, ±2%, 100 V	2	300-100-NPO-472G	51642	
C22	Same as C21				
C23 Thru C27	Same as C1				
C28	Same as C5				
C29	Same as C6				
C30	Same as C6				
C31	Same as C5				
C32	Capacitor, Ceramic, Monolithic: 820 pF, ±2%, 100 V	2	150-100-NPO-821G	51642	
C33	Capacitor, Ceramic, Monolithic: 470 pF, ±2%, 100 V	2	150-100-NPO-471G	51642	
C34	Same as C33				
C35	Same as C32				

REF DESIG PREFIX A10A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
CR1	Diode	2	5082-2800	28480	
CR2	Same as CR1				
FB1	Ferrite Bead	8	56-590-65-4A	02114	
FB2 Thru FB8	Same as FB1				
L1	Coil, Fixed, Molded: 10 µH	3	1025-44 (75084-12)	99800	
L2	Same as L1				
L3	Coil, Fixed: 0.33 µH, 10%	9	1537-04 (18130-3)	99800	
L4	Same as L3				
L5	Same as L3				
L6	Coil Fixed: 10 µH, 10%	1	1537-36 (14046-4)	99800	
L7 Thru L9	Same as L3				
L10	Same as L1				
L11 Thru L13	Same as L3				
L14	Inductor 1.75	2	20681-198	14632	
L15	Inductor 1.57	1	20681-152	14632	
L16	Same as L14				
R1	Resistor, Fixed, Film: 47Ω, 5%, 1/4 W	3	CF1/4-47 OHMS	09021	
R2	Same as R1				
R3	Resistor, Fixed, Film: 100Ω, 5%, 1/4 W	1	CF1/4-100 OHMS/J	09021	
R4	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	2	CF1/4-10K/J	09021	
R5	Same as R4				
R6	Resistor, Fixed, Film: 10 Ω, 5%, 1/4 W	2	CF1/4-10 OHMS/J	09021	
R7	Same as R6				
R8	Same as R1				
U1	Attenuator	1	G1	27956	
U2	Amplifier	1	QBH-138	55027	
U3	Amplifier	1	QBH-137	55027	
U4	Mixer Balanced	1	TAK-3H	15542	

REF DESIG PREFIX **A10A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
U5	Integrated Circuit	1	MC1458N	18324	
U6	Divider Power	2	PSC2-1	15542	
U7	Mixer Balanced	1	TFM-3H	15542	
U8	Integrated Circuit	1	MWA110	04713	
U9	Integrated Circuit	1	CA2850R	01281	
U10	Same as U6				

5.5.11 **TYPE 796655-1 THIRD LO SYNTHESIZER** REF DESIG PREFIX A11

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	First LO Synthesizer Assembly	1	380596-2	14632	
C1	Capacitor, Ceramic, Feedthru: 1000 pF, 20%, 500 V	7	54-794-000-102W	33095	
C2 Thru C7	Same as C1				
J1	Connector Receptacle	2	1012-1511-000	19505	
J2	Same as J1				
P1	Connector Receptacle	1	205206-3	00779	

5.5.11.1 **Part 380596-2 First LO Synthesizer Assembly** REF DESIG PREFIX **A11A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Ceramic, Disc: 470 pF, 10%, 200 V	1	CK05BX471K	81349	
C2	Capacitor, Ceramic, Disc: 6.8 pF, ±.1 pF, 500 V	1	ATC100B6R8BP-500X	29990	
C3	Capacitor, Ceramic, Chip: 4.7 pF, 0.1 pF, 500 V	1	ATC100B4R7BP-500X	29990	
C4	Capacitor, Composition, Tubular: .56 pF, 10%, 500 V	1	QCO.56PFK	95121	
C5	Capacitor, Ceramic, Chip: 10 pF, 2%, 500 V	1	ATC100B100GP500X	29990	
C6	Capacitor, Electrolytic, Tantalum: 4.7 µF, 20%, 35 V	5	196D475X0035JE3	56289	
C7	Not Used				
C8	Capacitor, Ceramic, Disc:.1 µF, 10%, 100 V	2	CK06BX104K	81349	
C9	Same as C8				
C10	Capacitor, Ceramic, Disc: .1 µF, 20%, 50 V	8	34475-1	14632	
C11	Capacitor, Ceramic, Disc: .01 µF, 20%, 50 V	12	34453-1	14632	
C12	Capacitor, Ceramic, Disc: .15 µF, 10%, 50 V	3	CK06BX154K	81349	
C13	Same as C10				
C14	Same as C12				
C15	Same as C6				
C16	Same as C11				
C17	Capacitor, Electrolytic, Tantalum: 18 µF, 10%, 20 V	7	196D186X9020KE3	56289	
C18	Capacitor, Ceramic, Disc: 220 pF, 10%, 200 V	9	CK05BX221K	81349	
C19	Same as C18				
C20	Same as C12				
C21	Capacitor, Ceramic, Chip: 22.0 pF, ±2%, 500 V	3	ATC100B220GP500X	29990	
C22 Thru C25	Same as C18				
C26	Capacitor, Ceramic, Chip: 3.3 pF, ±.1 pF, 500 V	1	ATC100B3R3BP-500X	29990	
C27	Capacitor, Variable, Air: 0.7-6.0 pF, 250 Vdc	1	8050	91293	
C28	Same as C21				
C29 Thru C31	Same as C11				
C32	Same as C10				
C33	Same as C11				
C34	Same as C10				
C35	Same as C11				

REF DESIG PREFIX A11A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C36	Same as C11				
C37	Same as C17				
C38	Same as C6				
C39	Same as C18				
C40	Capacitor, Ceramic, Chip: 220 pF, 10%, 500 V	2	ATC100B221KP500X	29990	
C41	Same as C18				
C42	Same as C17				
C43	Same as C17				
C44	Capacitor, Ceramic, Disc: .47 µF, 20%, 50 V	1	34452-1	14632	
C45	Capacitor, Ceramic, Monolithic: 91 pF, ±2%, 100 V	2	200-100-NPO-910G	51642	
C46	Capacitor, Ceramic, Monolithic: 160 pF, ±2%, 100 V	1	150-100-NPO-161G	51642	
C47	Same as C45				
C48	Same as C11				
C49	Same as C6				
C50	Same as C40				
C51	Capacitor, Ceramic, Chip: 501, ±2%, 50 V	1	ATC700B5R1GB-500X	29990	
C52	Not Used				
C53	Same as C21				
C54	Same as C18				
C55	Same as C11				
C56	Same as C11				
C57	Same as C10				
C58	Same as C6				
C59	Same as C10				
C60	Same as C17				
C61	Same as C10				
C62	Same as C17				
C63	Same as C10				
C64	Same as C17				
C65	Same as C11				
CR1	Diode, Varicap	14	KV3901	52673	

REF DESIG PREFIX A11A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
CR2 Thru CR12	Same as CR1				
CR13	Diode	1	5082-3188	28480	
CR14	Same as CR1				
CR15	Same as CR1				
DS1	Diode	1	HLMP-1301	28480	
L1	Coil, Fixed, Molded: .22 µH, 10%	1	1025-04 (75083-5)	99800	
L2	Not Used				
L3	Coil, Fixed, Molded: .33 µH, 10%	1	1025-08 (75083-7)	99800	
L4	Coil, Fixed: 0.39 µH, 10%	2	1025-10 (75083-8)	99800	
L5	Same as L4				
L6	Coil, Fixed: 0.27 µH	2	1025-06 (75083-6)	99800	
L7	Same as L6				
L8	Not Used				
L9	Coil, Fixed: 3.3 µH	1	1025-32 (75084-6)	99800	
Q1	Transistor	1	U310	17856	
Q2	Transistor	3	2N2222A	80131	
Q3	Same as Q2				
Q4	Same as Q2				
R1	Resistor, Fixed, Film: 221 Ω, 1%, 1/10 W	1	RN55C2210F	81349	
R2	Resistor, Fixed, Film: 274 Ω, 1%, 1/10 W	2	RN55C2740F	81349	
R3	Resistor, Fixed, Film: 825 Ω, 1%, 1/10 W	2	RN55C8250F	81349	
R4	Same as R3				
R5	Resistor, Fixed, Film: 750 Ω, 1%, 1/10 W	1	RN55C7500F	81349	
R6	Resistor, Fixed, Film: 1.0 kΩ, 1%, 1/10 W	5	RN55C1001F	81349	
R7	Resistor, Trim, Film: 500 Ω, 10%, 1/2 W	1	62PR500	73138	
R8	Same as R6				
R9	Same as R6				
R10	Resistor, Fixed, Film: 681Ω, 1%, 1/10 W	2	RN55C6810F	81349	
R11	Same as R10				
R12	Same as R6				

REF DESIG PREFIX A11A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R13	Same as R6				
R14	Resistor, Fixed, Film: 33.2 kΩ, 1%, 1/10 W	2	RN55C3322F	81349	
R15	Resistor, Fixed, Film: 150 Ω, 1%, 1/10 W	3	RN55C1500F	81349	
R16	Resistor, Fixed, Film: 39.2 Ω, 1%, 0.1 W	1	RN55D39R2F	81349	
R17	Same as R15				
R18	Resistor, Fixed, Film: 10 kΩ, 1%, 1/10 W	3	RN55C1002F	81349	
R19	Resistor, Fixed, Film: 8.25 kΩ, 1%, 1/10 W	3	RN55C8251F	81349	
R20	Resistor, Fixed, Film: 2.21 kΩ, 1%, 1/10 W	7	RN55C2211F	81349	
R21	Same as R20				
R22	Same as R20				
R23	Resistor, Fixed, Film: 15 kΩ, 1%, 1/10 W	2	RN55C1502F	81349	
R24	Same as R20				
R25	Same as R23				
R26	Same as R18				
R27	Same as R19				
R28	Same as R20				
R29	Same as R2				
R30	Resistor, Fixed, Film: 100 Ω, 1%, 1/10 W	4	RN55C1000F	81349	
R31	Same as R20				
R32	Resistor, Fixed, Film: 562 Ω, 1%, 1/10 W	2	RN55C5620F	81349	
R33	Same as R15				
R34	Same as R32				
R35	Resistor, Fixed, Film: 392 kΩ, 1%, 1/10 W	1	RN55C3923F	81349	
R36	Resistor, Fixed, Film: 1.5 kΩ, 1%, 1/10 W	1	RN55C1501F	81349	
R37	Same as R30				
R38	Same as R30				
R39	Resistor, Fixed, Film: 4.7 kΩ, 1%, 1/10 W	1	RN55C4751F	81349	
R40	Resistor, Fixed, Film: 6.81 kΩ, 1%, 1/10 W	1	RN55C6811F	81349	
R41	Same as R14				
R42	Same as R19				
R43	Same as R20				
R44	Same as R18				

REF DESIG PREFIX A11A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R45	Same as R30				
R46	Resistor, Fixed, Film: 475 Ω, 1%, 1/10 W	1	RN55C4750F	81349	
R47	Resistor, Fixed, Film: 200 Ω, 1%, 1/10 W	1	RN55C2000F	81349	
U1	Voltage Regulator	2	LM317H	27014	
U2	Integrated Circuit	1	MC145158P1	04713	
U3	Integrated Circuit	1	CD4094BE	02735	
U4	Integrated Circuit	1	LT1007CH	4W715	
U5	Integrated Circuit Divider	1	SP8719DG	52648	
U6	Integrated Circuit	1	MWA110	04713	
U7	Same as U1				
U8	Integrated Circuit	1	SP8685B	52648	
U9	Integrated Circuit Divider	1	SP8743B	52648	
U10	Integrated Circuit	1	CA6741T	02735	
Z1	Transmission Line	1	281571-1	14632	

5.5.12 TYPE 796652-1 FOURTH CONVERTER ASSEMBLY REF DESIG PREFIX A12

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	Fourth Converter Assembly	1	381314-1	14632	
C1	Capacitor, Ceramic, Feedthru: 470 pF, 20%, 500 V	7	54-794-009-471M	33095	
C2 Thru C6	Same as C1				
J1	Connector, Receptacle	3	1012-1511-000	19505	
J2	Same as J1				
J3	Same as J1				
P1	Connector, Receptacle	1	205206-3	00779	

5.5.12.1 **Part 381314-1 Fourth Converter Assembly** REF DESIG PREFIX A12A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
AT1	Attenuator, Bridget-T: 500Ω, 1/8 W	2	9955-1050	84048	
AT2	Same as AT1				
C1	Capacitor, Ceramic, Disc: .47 µF, 20%, 50 V	12	34452-1	14632	
C2 Thru C12	Same as C1				
C13	Capacitor, Ceramic, Disc: .1 µF, 20%, 50 V	6	34475-1	14632	
C14 Thru C16	Same as C13				
C17	Capacitor, Electrolytic, Tantalum: 1 µF, 20%, 35 V	2	196D105X0035HE3	56289	
C18	Same as C17				
C19	Capacitor, Ceramic, Monolithic: 120 pF, ±2%, 100 V	2	200-100-NPO-121G	51642	
C20	Same as C19				
C21	Capacitor, Ceramic, Monolithic: 360 pF	2	150-100-NPO-361G	51642	
C22	Same as C21				
C23	Same as C13				
C24	Same as C13				
C25	Capacitor, Electrolytic, Tantalum: 4.7 µF, 20%, 35 V	1	196D475X0035JE3	56289	
C26	Capacitor, Micro - Q Dip: 03 µF, 25 V, 50 V	3	Q - 14.03	31745	
C27	Same as C26				
C28	Same as C26				
CR1	Diode	6	5082-3188	28480	
CR2 Thru CR6	Same as CR1				
FL1	Filter	1	92397	14632	
FL2	Filter	1	92396	14632	
L1	Coil, Fixed: 10 µH, 10%	3	1537-36 (14046-4)	99800	
L2	Same as L1				
L3	Coil, Fixed: 0.68 µH	2	1025-16 (75083-11)	99800	
L4	Same as L3				
L5	Same as L1				
Q1	Transistor	2	2N5109	80131	
Q2	Same as Q1				

REF DESIG PREFIX A12A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R1	Resistor, Fixed, Film: 1.5 kΩ, 5%, 1/4 W	3	CF1/4-1.5K/J	09021	
R2	Same as R1				
R3	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1/4 W	2	CF1/4-4.7K/J	09021	
R4	Same as R1				
R5	Same as R3				
R6	Resistor, Fixed, Film: 300Ω, 5%, 1/4 W	4	CF1/4-300 OHMS/J	09021	
R7	Resistor, Fixed, Film: 18Ω, 5%, 1/4 W	2	CF1/4-18 OHMS/J	09021	
R8	Same as R6				
R9	Resistor, Fixed, Film: 2.7 kΩ, 5%, 1/4 W	2	CF1/4-2.7K/J	09021	
R10	Same as R6				
R11	Same as R7				
R12	Same as R6				
R13	Same as R9				
R14	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	4	CF1/4-10K/J	09021	
R15	Same as R14				
R16	Same as R14				
R17	Resistor, Fixed, Film: 2.2 kΩ, 5%, 1/4 W	1	CF1/4-2.2K/J	09021	
R18	Resistor, Fixed, Film: 10Ω, 5%, 1/4 W	3	CF1/4-10 OHMS/J	09021	
R19	Same as R18				
R20	Resistor Fixed, Film: 47Ω, 5%, 1/4 W	2	CF1/4-47 OHMS/J	09021	
R21	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	1	CF1/4-100K/J	09021	
R22	Same as R14				
R23	Same as R18				
R24	Same as R20				
T1	Transformer	1	T2-1T	15542	
U1	Amplifier	1	QBH-137	55027	
U2	Integrated Circuit	1	MC3403P	04713	
U3	Amplifier	1	QBH-138	55027	
U4	Mixer, Balanced	1	TAK-3H	15542	
U5	Integrated Circuit, Gate	1	MM74HC86N	27014	
U6	Integrated Circuit	1	MM74HC74N	27014	
U7	Integrated Circuit	1	MM74HC00N	27014	

5.5.13 TYPE 481097-1 OUTPUT/FILTER DRIVER

REF DESIG PREFIX A13

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
AT1	Atten/Bridget-T	1	9950-1050	84048	
C1	Capacitor, Ceramic, Disc: .01 µF, 20%, 50 V	16	34453-1	14632	
C2	Same as C1				
C3	Same as C1				
C4	Capacitor, Ceramic, Disc: 1 µF, 20%, 50 V	4	8131-050-651-105M	59660	
C5	Capacitor, Electrolytic, Tantalum: 4.7 µF, 20%, 35 V	23	196D475X0035JE3	56289	
C6	Same as C4				
C7	Same as C5				
C8	Same as C5				
C9	Capacitor, Ceramic, Monolithic: 470 pF, 2%, 100 V	2	150-100-NPO-471G	51642	
C10 Thru C14	Same as C5				
C15	Capacitor, Polycarbonate: .1 µF, 2%, 100 V	1	MPCW-104-1-2	04099	
C16	Same as C5				
C17	Capacitor, Ceramic, Disc: .1 µF, 20%, 50 V	5	34475-1	14632	
C18	Same as C17				
C19	Same as C17				
C20	Same as C5				
C21	Same as C5				
C22	Same as C17				
C23	Capacitor, Ceramic, Disc: .47 µF, 20%, 50 V	1	34452-1	14632	
C24	Same as C1				
C25	Same as C5				
C26	Not Used				
C27	Not Used				
C28	Same as C5				
C29	Same as C1				

REF DESIG PREFIX A13

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C30	Same as C1				
C31	Same as C5				
C32	Not Used				
C33	Same as C5				
C34 Thru C38	Same as C1				
C39	Capacitor, Electrolytic, Tantalum: 22 µF, 20%, 10 V	1	196D226X0010JE3	56289	
C40	Same as C17				
C41	Capacitor, Ceramic, Monolithic: 3900 pF, ±2%, 100 V	2	300-100-NPO-392G	51642	
C42	Capacitor, Ceramic, Monolithic: 180 pF, ±2%, 100 V	2	300-100-NPO-181G	51642	
C43	Capacitor, Ceramic, Monolithic: 4300 pF, ±2%, 100 V	2	300-100-NPO-432G	51642	
C44	Capacitor, Ceramic, Monolithic: 82 pF, ±2%, 100 V	1	200-100-NPO-820G	51642	
C45	Capacitor, Ceramic, Monolithic: 1100 pF, ±2%, 100 V	1	150-100-NPO-112G	51642	
C46	Capacitor, Ceramic, Monolithic: 33 pF, ±2%, 100 V	2	150-100-NPO-330G	51642	
C47	Capacitor, Ceramic, Monolithic: 8200 pF, ±2%, 100 V	3	300-100-NPO-822G	51642	
C48	Same as C47				
C49	Capacitor, Ceramic, Monolithic: 560 pF, 2%, 100 V	3	150-100-NPO-561G	51642	
C50	Capacitor, Ceramic, Monolithic:2200 pF, ±2%, 100 V	2	200-100-NPO-222G	51642	
C51	Same as C49				
C52	Capacitor, Ceramic, Monolithic: 2000 pF, ±2%, 100 V	1	200-100-NPO-202G	51642	
C53	Same as C50				
C54	Same as C49				
C55	Capacitor, Ceramic, Monolithic: 20 pF, ±2%, 100 V	1	100-100-NPO-200G	51642	
C56	Capacitor, Ceramic, Monolithic: 300 pF, ±2%, 100 V	2	150-100-NPO-301G	51642	
C57	Capacitor, Ceramic, Monolithic: 6800 pF, ±2%, 100 V	1	300-100-NPO-682G	51642	
C58	Capacitor, Ceramic, Monolithic: 390 pF, ±2%, 100 V	1	150-100-NPO-391G	51642	
C59	Same as C47				
C60	Capacitor, Ceramic, Monolithic: 10000 pF, ±2%, 100 V	2	300-100-NPO-103G	51642	
C61	Same as C60				
C62	Capacitor, Ceramic, Monolithic: 18 pF, ±2%, 100 V	1	100-100-NPO-180G	51642	
C63	Capacitor, Ceramic, Monolithic: 330 pF, ±2%, 100 V	1	150-100-NPO-331G	51642	

REF DESIG PREFIX A13

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C64	Same as C41				
C65	Same as C43				
C66	Capacitor, Ceramic, Monolithic: 270 pF, ±2%, 100 V	2	150-100-NPO-271G	51642	
C67	Capacitor, Ceramic, Monolithic: 10 pF, ±2%, 100 V	2	100-100-NPO-100G	51642	
C68	Capacitor, Ceramic, Monolithic: 200 pF, ±2%, 100 V	2	150-100-NPO-201G	51642	
C69	Capacitor, Ceramic, Monolithic: 620 pF, ±2%, 100 V	2	300-100-NPO-622G	51642	
C70	Capacitor, Ceramic, Monolithic: 3000 pF, ±2%, 100 V	1	200-100-NPO-302G	51642	
C71	Capacitor, Ceramic, Monolithic: 100 pF, ±2%, 100 V	1	200-100-NPO-101G	51642	
C72	Capacitor, Ceramic, Monolithic: 36 pF, ±2%, 100 V	1	150-100-NPO-360G	51642	
C73	Capacitor, Ceramic, Monolithic: 5100 pF, ±2%, 100 V	1	300-100-NPO-512G	51642	
C74	Capcaitor, Ceramic, Monolithic: 220 pF, ±2%, 100 V	2	150-100-NPO-221G	51642	
C75	Same as C74				
C76	Same as C69				
C77	Same as C56				
C78	Capacitor, Ceramic, Monolithic: 12 pF, ±2%, 100 V	1	100-100-NPO-120G	51642	
C79	Same as C1				
C80	Capacitor, Ceramic, Monolithic: 4700 pF, ±2%, 100 V	1	300-100-NPO-472G	51642	
C81	Capacitor, Ceramic, Monolithic: 68 pF, ±2%, 100 V	1	200-100-NPO-680G	51642	
C82	Same as C42				
C83	Same as C46				
C84	Capacitor, Ceramic, Monolithic: 240 pF, ±2%, 100 V	1	150-100-NPO-241G	51642	
C85	Same as C66				
C86	Capacitor, Ceramic, Monolithic: 360 pF, ±2%, 100 V	3	150-100-NPO-361G	51642	
C87	Capacitor, Ceramic, Monolithic: 180 pF, ±2%, 100 V	2	150-100-NPO-181G	51642	
C88	Same as C87				
C89	Same as C67				
C90	Same as C68				
C91	Capacitor, Ceramic, Monolithic: 75 pF, ±2%, 100 V	1	200-100-NPO-750G	51642	
C92	Same as C5				
C93	Same as C1				
C94	Same as C5				
C95	Same as C5				

REF DESIG PREFIX A13

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C96	Same as C1				
C97	Same as C5				
C98	Same as C4				
C99	Same as C86				
C100	Same as C1				
C101 Thru C103	Same as C5				
C104	Same as C1				
C105	Same as C5				
C106	Same as C4				
C107	Same as C86				
C108	Capacitor, Ceramic, Monolithic: 330 pF, ±2%, 100 V	1	200-100-NPO-332G	51642	
C109	Capacitor, Ceramic, Chip:2.2 pF, ±.1pF, 500 V	2	ATC100B2R2BP-500X	29990	
C110	Same as C109				
C111	Same as C9				
C112	Chip Capacitor	2	841250-19	14632	
C113	Same as C112				
CR1	Diode	7	1N4449	80131	
CR2	Same as CR1				
CR3	Diode	4	5082-2800	28480	
CR4	Same as CR3				
CR5	Same as CR3				
CR6	Not Used				
CR7	Same as CR3				
CR8 Thru CR12	Same as CR1				
J1	Connector, Plug	1	205857-1	00779	
J2	Connector	2	1010-7511-001	19505	
J3	Same as J2				
K1	Relay	8	818-101	18542	
K2 Thru K8	Same as K1				

REF DESIG PREFIX A13

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
L1	Coil, Fixed, Molded: 10 µH	10	1025-44 (75084-12)	99800	
L2	Same as L1				
L3	Same as L1				
L4	Coil, Fixed, Molded: 15 µH, 10%	1	1025-48 (75084-14)	99800	
L5	Same as L1				
L6	Same as L1				
L7	Not Used				
L8	Same as L1				
L9	Coil, Fixed: 47 µH, 10%	1	1025-60 (75085-3)	99800	
L10	Coil: 184 µH	1	30312-249	14632	
L11	Coil: 125 µH	1	30312-251	14632	
L12	Coil, Variable: 19.8-24.2 µH	1	558-7107-29	71279	
L13	Coil, Variable: 13.5-16.5 µH	1	558-7107-27	71279	
L14	Coil, Variable: 1.62-1.98 µH	1	558-7107-16	71279	
L15	Coil: 5.77 µH	2	30312-105	14632	
L16	Coil: 3.9 µH	1	30312-159	14632	
L17	Coil	1	30312-304	14632	
L18	Coil	2	30312-334	14632	
L19	Coil	1	30312-291	14632	
L20	Same as L18				
L21	Coil	1	30312-335	14632	
L22	Coil	2	30312-102	14632	
L23	Same as L15				
L24	Same as L22				
L25	Same as L1				
L26	Coil, Fixed: .68 µF, 10%	1	1025-16	99800	
L27	Same as L1				
L28	Same as L1				
L29	Same as L26				
L30	Same as L1				
Q1	Transistor	1	U310	17856	
Q2	Transistor	1	2N3251	80131	

REF DESIG PREFIX **A13**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
Q3	Transistor	8	2N7000	17856	
Q4 Thru Q10	Same as Q3				
R1	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	11	CF1/4-10K/J	09021	
R2	Same as R1				
R3	Same as R1				
R4	Resistor, Fixed, Film: 3.3 MΩ, 5%, 1/4 W	1	CF1/4-3.3MEG/J	09021	
R5	Resistor, Fixed, Film: 1.0 MΩ, 5%, 1/4 W	1	CF1/4-1M/J	09021	
R6	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/4 W	4	CF1/4-1K/J	09021	
R7	Resistor, Fixed, Film: 270 Ω, 5%, 1/4 W	1	CF1/4-270 OHMS/J	09021	
R8	Resistor, Fixed, Film: 47 Ω, 5%, 1/4 W	12	CF1/4-47 OHMS	09021	
R9	Same as R8				
R10	Same as R8				
R11	Resistor, Fixed, Film: 221 Ω, 1%, 1/10 W	1	RN55C2210F	81349	
R12	Resistor, Fixed, Film: 200 Ω, 5%, 1/4 W	2	CF1/4-200 OHMS/J	09021	
R13	Resistor, Fixed, Film: 10 Ω, 5%, 1/4 W	18	CF1/4-10 OHMS/J	09021	
R14	Resistor, Fixed, Film: 1.82 kΩ, 1%, 1/10 W	4	RN55C1821F	81349	
R15	Same as R14				
R16	Same as R13				
R17	Resistor, Fixed, Film: 330 kΩ, 5%, 1/4 W	1	CF1/4-330K/J	09021	
R18	Resistor, Trimmer, Film: 1MΩ, 10%, 1/2 W	2	62PR1M	73138	
R19	Resistor, Fixed, Film: 180 kΩ, 5%, 1/4 W	1	CF1/4-180K/J	09021	
R20	Resistor, Trimmer, Film: 5 kΩ, 10%, 1/2 W	5	62PR5K	73138	
R21	Resistor, Fixed, Film: 2.7 kΩ, 5%, 1/4 W	4	CF1/4-2.7K/J	09021	
R22	Same as R18				
R23	Resistor, Fixed, Film: 220 kΩ, 5%, 1/4 W	1	CF1/4-220K/J	09021	
R24	Resistor, Fixed, Film: 47 kΩ, 5%, 1/4 W	2	CF1/4-47K/J	09021	
R25	Same as R14				
R26	Resistor, Fixed, Film: 221Ω , 1%, 1/10 W	2	RN55C2213F	81349	
R27	Same as R13				
R28	Same as R14				
R29	Same as R26				

REF DESIG PREFIX A13

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R30	Same as R13				
R31	Same as R6				
R32	Same as R21				
R33	Same as R6				
R34	Resistor, Fixed, Film: 680Ω, 5%, 1/4 W	2	CF1/4-680 OHMS/J	09021	
R35	Same as R20				
R36	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1/4 W	3	CF1/4-4.7K/J	09021	
R37	Resistor, Trimmer, Film: 10 kΩ, 10%, 1/2 W	1	62PR10K	73138	
R38	Resistor, Fixed, Film: 2.0 kΩ, 5%, 1/4 W	1	CF1/4-2K/J	09021	
R39	Resistor, Trimmer, Film: 50 kΩ, 10%, 1/2 W	1	62PR50K	73138	
R40	Resistor, Fixed, Film: 36 kΩ, 5%, 1/4 W	2	CF1/4-36K/J	09021	
R41	Resistor, Trimmer, Film: 100 kΩ, 10%, 1/2 W	1	62PR100K	73138	
R42	Resistor, Fixed, Film: 120 kΩ, 5%, 1/4 W	1	CF1/4-120K/J	09021	
R43	Resistor, Trimmer, Film: 500 kΩ, 10%, 1/2 W	1	62PR500K	73138	
R44	Same as R8				
R45	Resistor, Fixed, Film: 1.5 kΩ, 5%, 1/4 W	1	CF1/4-1.5K/J	09021	
R46	Same as R20				
R47	Same as R36				
R48	Resistor, Trimmer, Film: 20 kΩ, 10%, 1/2 W	1	62PR20K	73138	
R49	Resistor, Fixed, Film: 22 kΩ, 5%, 1/4 W	1	CF1/4-22K/J	09021	
R50	Same as R39				
R51	Same as R40				
R52	Resistor, Trimmer, Film: 200 kΩ, 10%, 1/2 W	2	62PR200K	73138	
R53	Resistor, Fixed, Film: 120 kΩ, 5%, 1/4 W	1	CF1/4-120K/J	09021	
R54	Same as R52				
R55	Same as R20				
R56	Same as R36				
R57	Same as R1				
R58	Resistor, Fixed, Film: 1.2 kΩ, 5%, 1/4 W	1	CF1/4-1.2K/J	09021	
R59	Same as R1				
R60	Same as R1				
R61	Same as R21				

REF DESIG PREFIX **A13**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R62	Same as R20				
R63	Same as R8				
R64	Same as R8				
R65	Same as R13				
R66	Resistor, Fixed, Film: 100Ω , 5%, 1/4 W	2	CF1/4-100 OHMS/J	09021	
R67	Same as R21				
R68	Same as R13				
R69	Same as R34				
R70	Resistor, Trimmer, Film: 1 kΩ, 10%, 1/2 W	3	62PAR1K	73138	
R71	Resistor, Fixed, Film: 8.25 kΩ, 1%, 1/10 W	1	RN55C8251F	81349	
R72 Thru R74	Same as R8				
R75	Same as R6				
R76	Same as R8				
R77	Same as R24				
R78	Same as R1				
R79	Same as R13				
R80	Resistor, Fixed, Film: 200 Ω, 1%, 1/10 W	4	RN55C2000F	81349	
R81	Resistor, Fixed, Film: 2.21 kΩ, 1%, 1/10 W	1	RN55C2211F	81349	
R82	Same as R70				
R83	Resistor, Fixed, Film: 49.9 Ω, 1%, 1/10 W	8	RN55C49R9F	81349	
R84	Same as R13				
R85	Same as R13				
R86	Same as R80				
R87	Resistor, Fixed, Film: 475 Ω, 1%, 1/10 W	1	RN55C4753F	81349	
R88	Same as R70				
R89	Same as R83				
R90	Same as R13				
R91	Same as R1				
R92	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	4	CF1/4-100K/J	09021	
R93	Same as R1				
R94	Same as R92				

REF DESIG PREFIX A13

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R95	Same as R1				
R96	Same as R92				
R97	Same as R1				
R98	Same as R92				
R99	Same as R13				
R100	Same as R80				
R101 Thru R105	Same as R83				
R106	Same as R80				
R107	Resistor, Fixed, Film: 1.0 kΩ, 1%, 1/10 W	2	RN55C1001F	81349	
R108	Resistor, Fixed, Film: 82.5 Ω, 1%, 1/10 W	1	RN55C82R5F	81349	
R109	Same as R107				
R110	Same as R12				
R111	Resistor, Fixed, Film: 22.1 Ω, 1%, 1/10 W	2	RN55C22R1F	81349	
R112	Same as R13				
R113	Same as R13				
R114	Resistor, Fixed, Film: 243 Ω, 1%, 1/10 W	2	RN55C2430F	81349	
R115	Same as R8				
R116	Resistor, Fixed, Film: 68.1 Ω, 1%, 1/10 W	2	RN55C68R1F	81349	
R117 Thru R120	Same as R13				
R121	Same as R111				
R122	Same as R114				
R123	Same as R8				
R124	Same as R13				
R125	Same as R13				
R126	Same as R116				
R127	Resistor, Fixed, Chip: 47 Ω, 2%, 1 W	2	S2010CPX470G	56235	
R128	Same as R66				
R129	Resistor, Fixed, Film: 180 Ω, 5%, 1/8 W	2	CFV8-180-OHMS/J	09021	
R130	Same as R129				
U1	Integrated Circuit Op Amp	6	HA1-2539-5	34371	

REF DESIG PREFIX **A13**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
U2	Same as U1				
U3	Integrated Circuit	2	CD4051AE	02735	
U4	Same as U3				
U5	Integrated Circuit	1	LM318H	27014	
U6	Integrated Circuit	2	DG200BA	17856	
U7	Integrated Circuit	1	MM74HC00N	27014	
U8	Integrated Circuit	2	MC34002P	04713	
U9	Integrated Circuit, V-Ref	2	LM336Z-5.0	27014	
U10	Same as U6				
U11	Same as U8				
U12	Amplifier	1	LG1	14482	
U13	Same as U9				
U14	Integrated Circuit	1	MC1458N	18324	
U15 Thru U17	Same as U1				
U18	Integrated Circuit	2	LH0002CN	27014	
U19	Same as U1				
U20	Same as U18				
VR1	Diode	1	1N751A	80131	

SECTION VI

SCHEMATICS

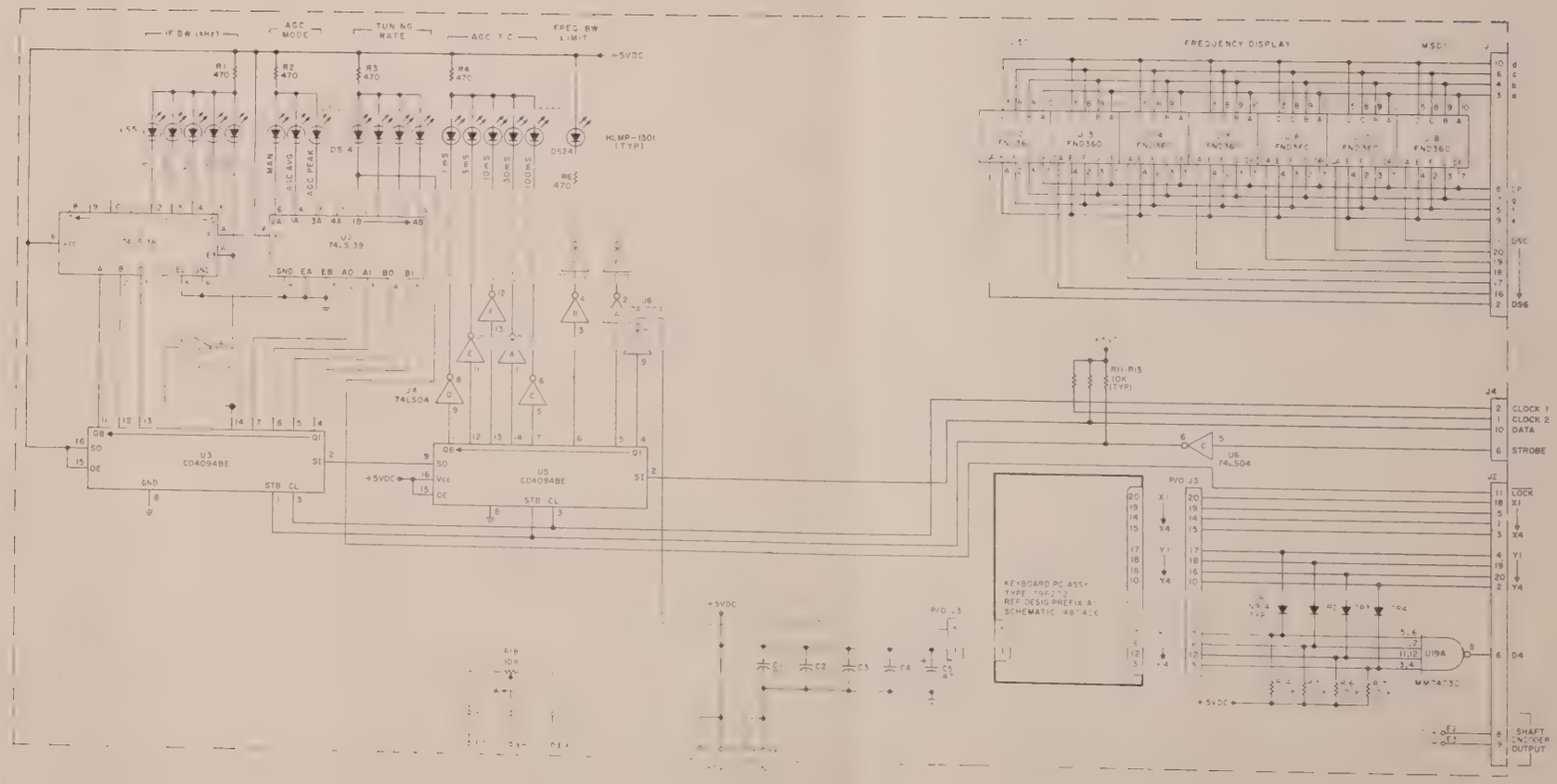


Figure 6-1. Type 796273-6, Front Panel Display (A1), Schematic Diagram 580684 (02)

NOTES:
1. DIFFERENCE BETWEEN TYPES IS SHOWN IN TABLE I.

TABLE I

TYPE NO.	S9	S14	S4	S10	S23	S18	S19
796272-1	DE EMPH	10Ø LPF	VID ATTEN	DET MODE	△ FREQ	IF BW	GAIN CONT
796272-2	BLANK	BLANK	VID ATTEN	DET MODE	△ FREQ	IF BW	GAIN CONT
796272-3	TRANS IF	EXT LO	VID ATTEN	DET MODE	△ FREQ	IF BW	GAIN CONT
796272-4	VID BW	BLANK	VID ATTEN	DET MODE	△ FREQ	IF BW	GAIN CONT
796272-5	GAIN CONT	AGC TC	BLANK	BLANK	CLEAR ENTRY	BLANK	IF BW

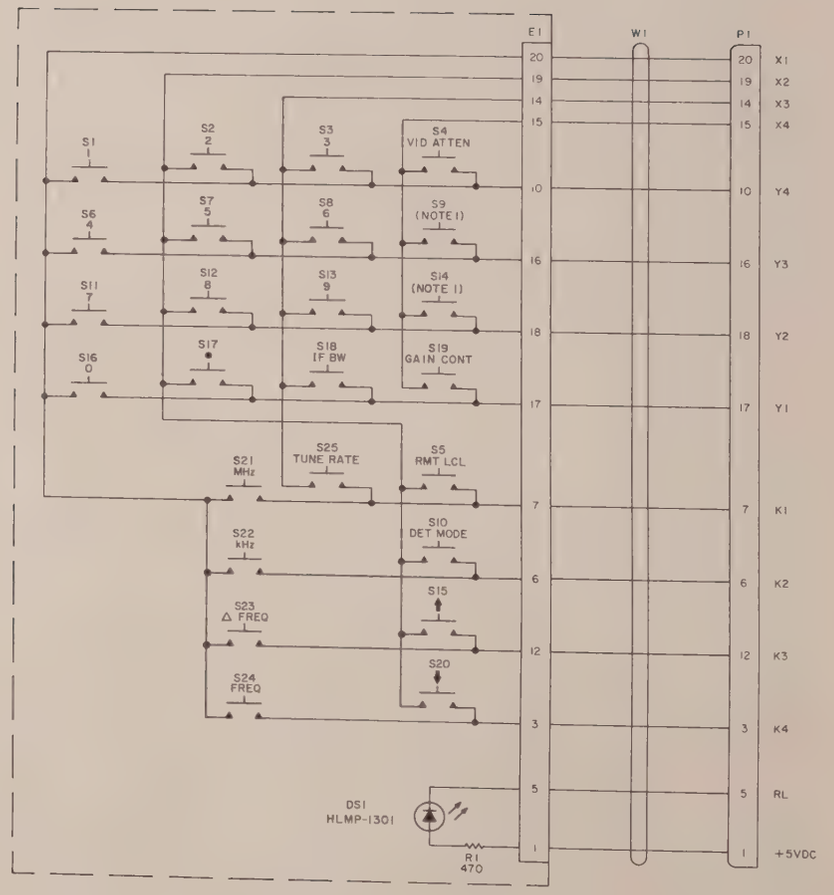


Figure 6-2. Type 796272-5, Keyboard Assembly (A1A1), Schematic Diagram 480406 (A)

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) CAPACITANCE IS IN pF.
   b) INDUCTANCE IS IN μH.

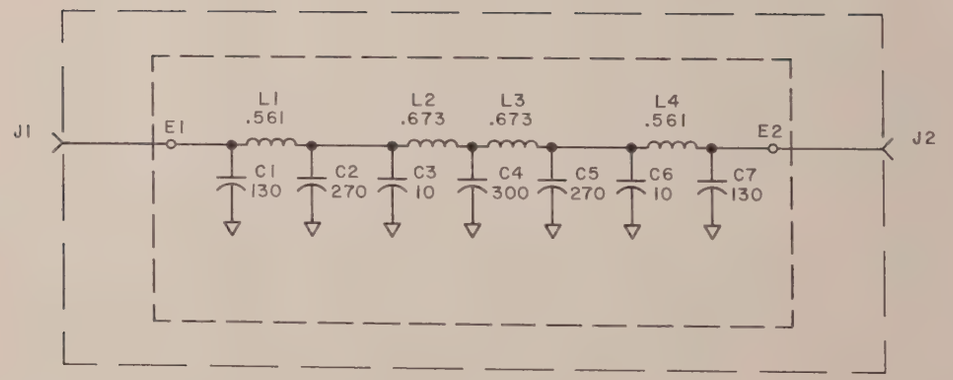


Figure 6-3. Type 796659-1, Input Filter Assembly (A2), Schematic Diagram 381306 (01)

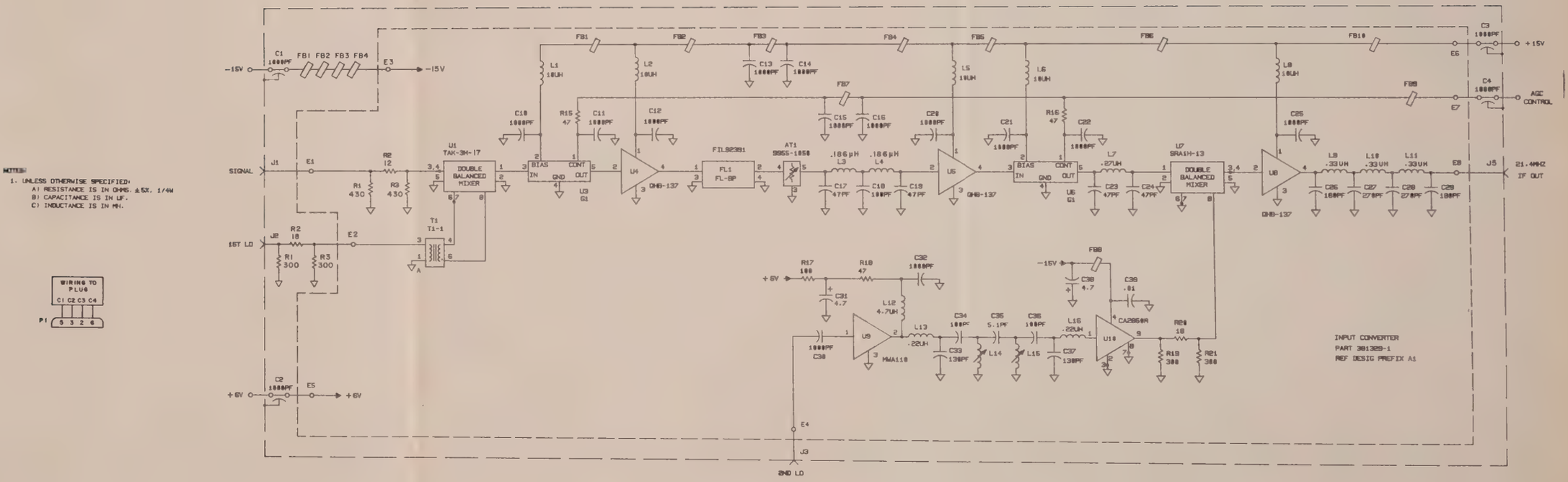


Figure 6-4. Type 796650-1, Input Converter Assembly (A3), Schematic Diagram 481061 (07)

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   A) RESISTANCE IS IN OHMS. ±5%.1/4W.
   B) CAPACITANCE IS IN UF.

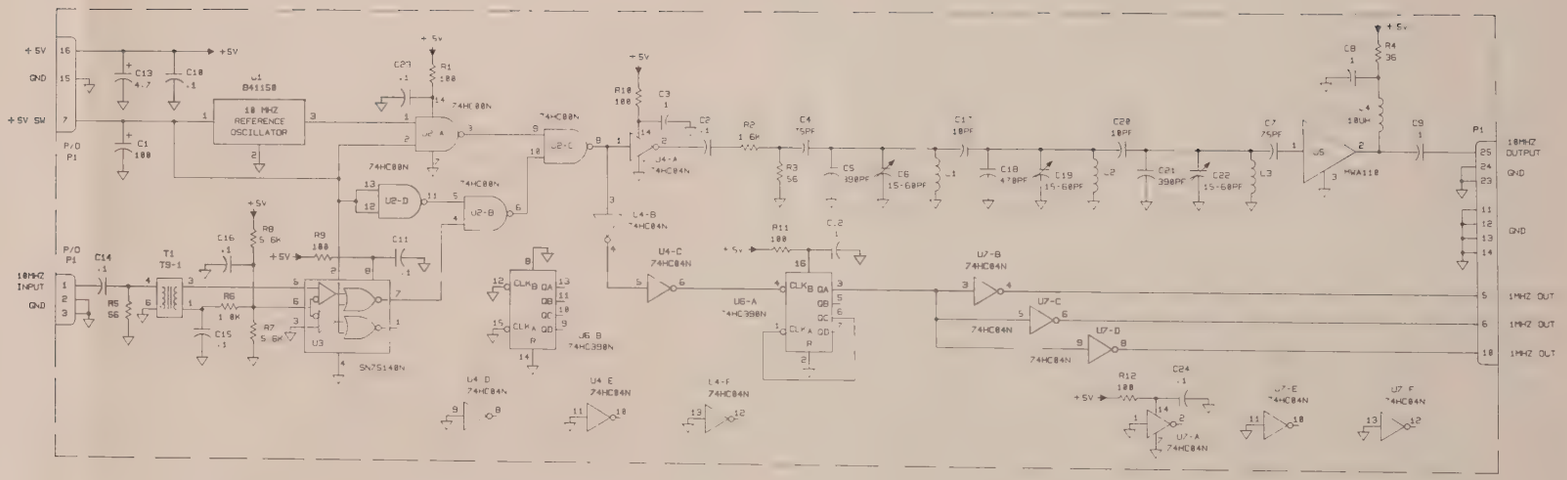


Figure 6-5. Type 796628-1, Reference Generator Assembly (A4), Schematic Diagram 481001 (03)

NOTES

1. UNLESS OTHERWISE SPECIFIED
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W
   b) CAPACITANCE IS IN pF
   c) INDUCTANCE IS IN mH
2. LEAD ARRANGEMENT FOR VR1 IS SHOWN IN DETAIL A
3. LETTERS (NUMBERS) ARE MODULE (A2) PINS GND PINS FOR GND_1, GND_2, GND_3, ARE LISTED IN TABLE A
4. MAY BE A JUMPER WIRE OR A RESISTOR UP TO 5 OHMS, ±5%, 1/4 W AS REQUIRED.

TABLE A

GND	MODULE PIN
GND_1	A48, 50, 52, 54, 56, 58, 60
GND_2	A2, 4, 6, 8, 10, 14, 16, 18, 20, 42, 44, 46
GND_3	B2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 42, 44, 46, 48, 50, 52, 54, 56, 58

DETAIL A

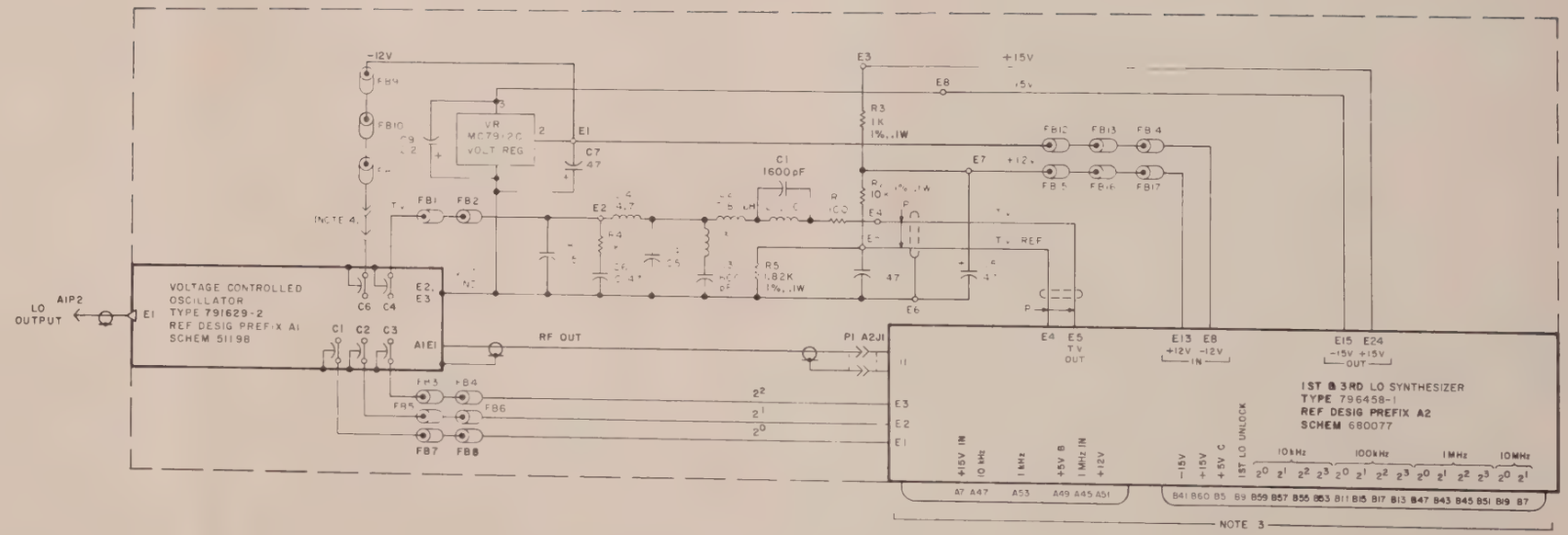


Figure 6-6. Type 796453-1, 1st and 3rd LO Synthesizer (A5), Schematic Diagram 480669 (A)

NOTES:
1. UNLESS OTHERWISE SPECIFIED
   a) RESISTANCE IS IN OHMS ±5%, 1/8W
   b) CAPACITANCE IS IN pF.
2. NOMINAL VALUE; FINAL VALUE FACTORY SELECTED.
3. DIFFERENCE BETWEEN 791629-1 AND 791629-2 AND 791629-3 IS MECHANICAL.

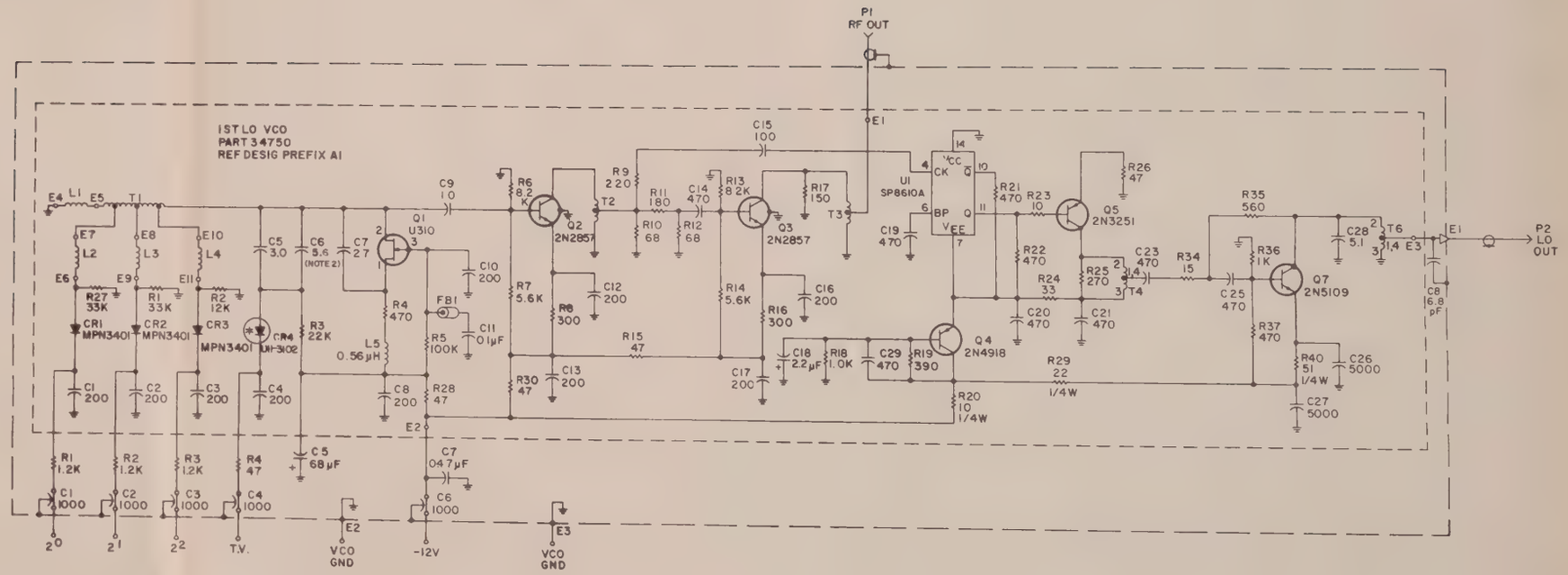


Figure 6-7. Type 791629-2, 1st LO VCO (A5A1), Schematic Diagram 51198 (P)

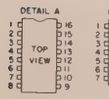
NOTES.
1. UNLESS OTHERWISE SPECIFIED
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS IN μF.
2. VCC, GND PINS OF IC,S ARE SHOWN IN TABLE A.
3. LEAD ARRANGEMENT FOR IC,S ARE SHOWN IN TABLE A.
4. NOMINAL VALUE. FINAL VALUE FACTORY SELECTED.

5. GROUND LEVEL PINS ARE LISTED BELOW.
   a) PIN NOS. OF GND LEVEL ONE ARE A48, A50, A52, A54, A56 & A58.
   b) GND LEVEL TWO ARE A2, A4, A6, A8, A10, A12, A14, A16, A18 A20, A42, A44, A46, A43.
   c) GND LEVEL THREE ARE B2, B4, B6, B8, B10, B12, B14, B16, B18, B20 B42, B44, B46, B48, B50, B52, B54, B56 & B58.

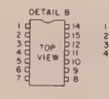
TABLE A

IC	REF DESIG	VCC 1	VCC 2	VCC 3	GND 1	GND 2	GND 3	DTL	VCC2 (FIL)
MC4044	U5			14			7	B	
MC4044	U22					7		B	14
MC12013L	U1			16			8	A	
MC12014L	U3			16			8	A	
SN74LS196N	U9			14			7	B	
SN74LS196	U2			14			7	B	
SN7400	U6			14			7	B	
6331-J1	U4			16			8	B	
SN74LS190	U8, U10			16			8	A	
SN74LS190N	U11			16			8	A	
DM74184N	U13			16			8	A	
SN74LS196N	U19		14			7		B	
74LS74	U21					7		B	14
SN74LS196N	U15, U17	14				7		B	
SN74LS196N	U18		14			7		B	
CA741T	U7							C	
SN74LS74	U12			14			7	B	
SN74LS02	U24			14			7	B	

DETAIL A



DETAIL B



DETAIL C

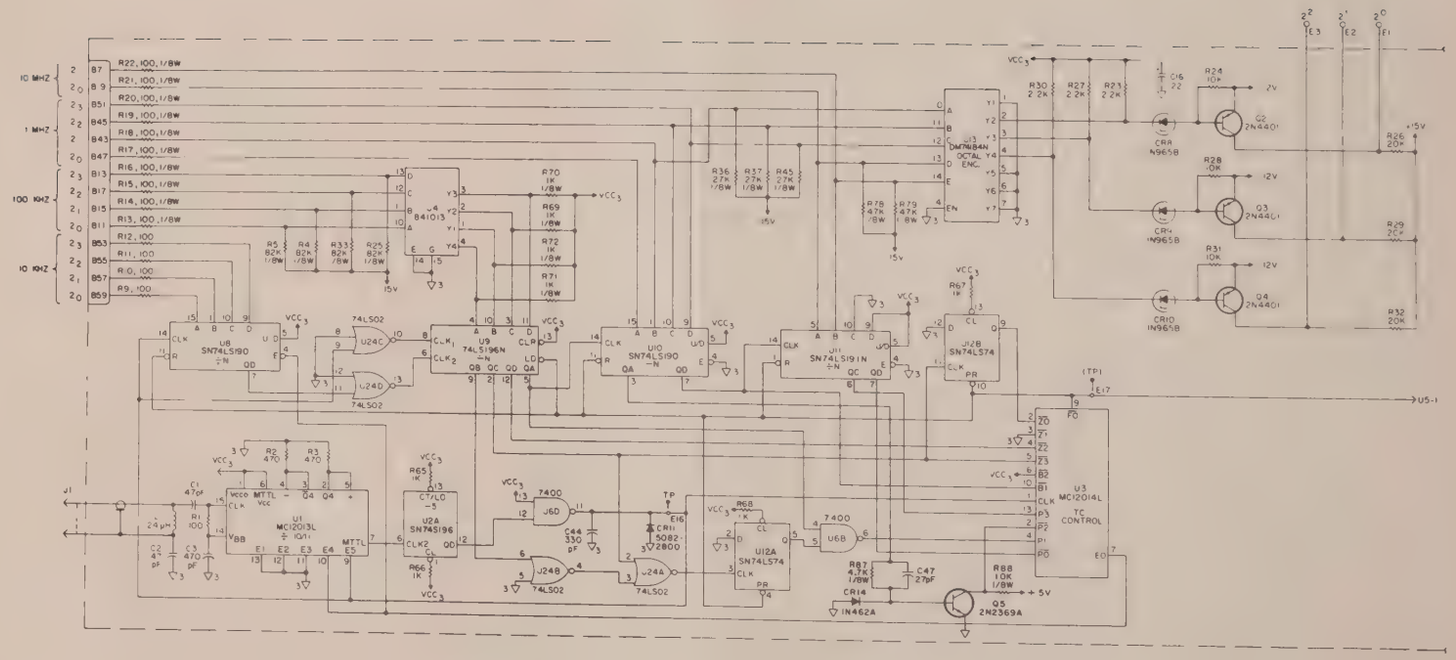


Figure 6-8. **Type 796458-1, 1st and 3rd LO Synthesizer (A5A2), Schematic Diagram 680077 (Sheet 1 of 2) (F)**

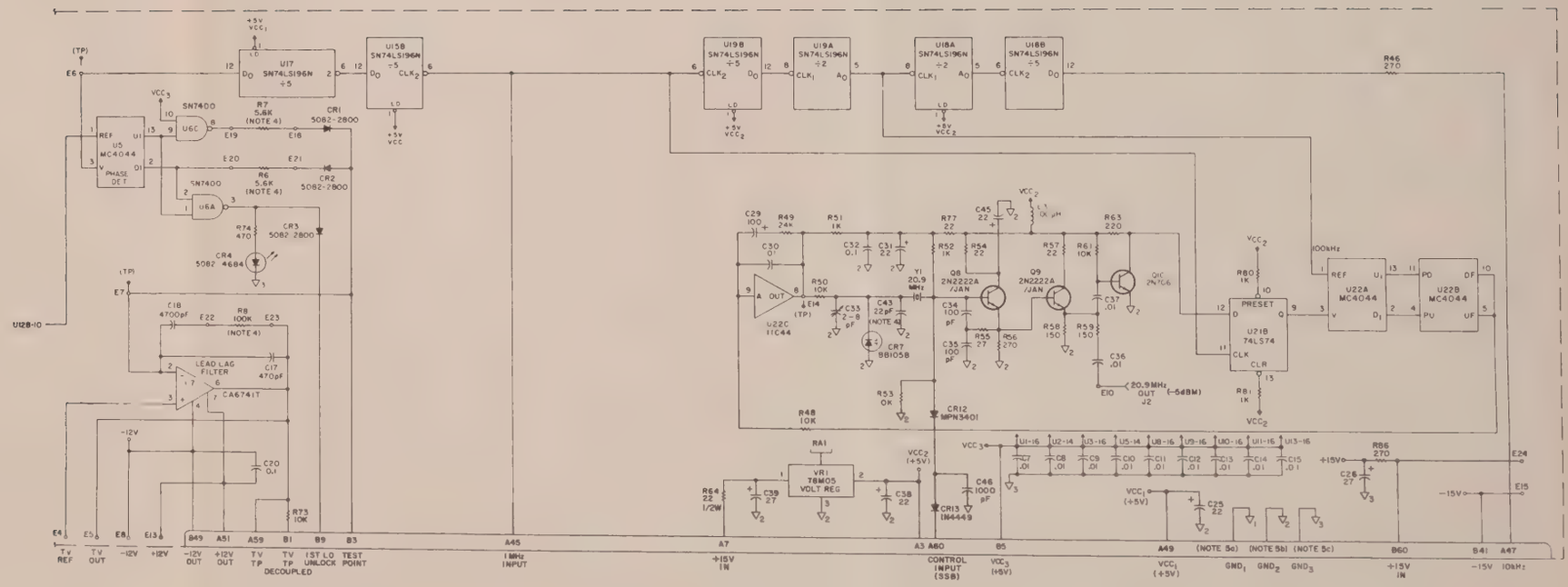


Figure 6-8. **Type 796458-1, 1st and 3rd LO Synthesizer (A5A2), Schematic Diagram 680077 (Sheet 2 of 2) (F)**

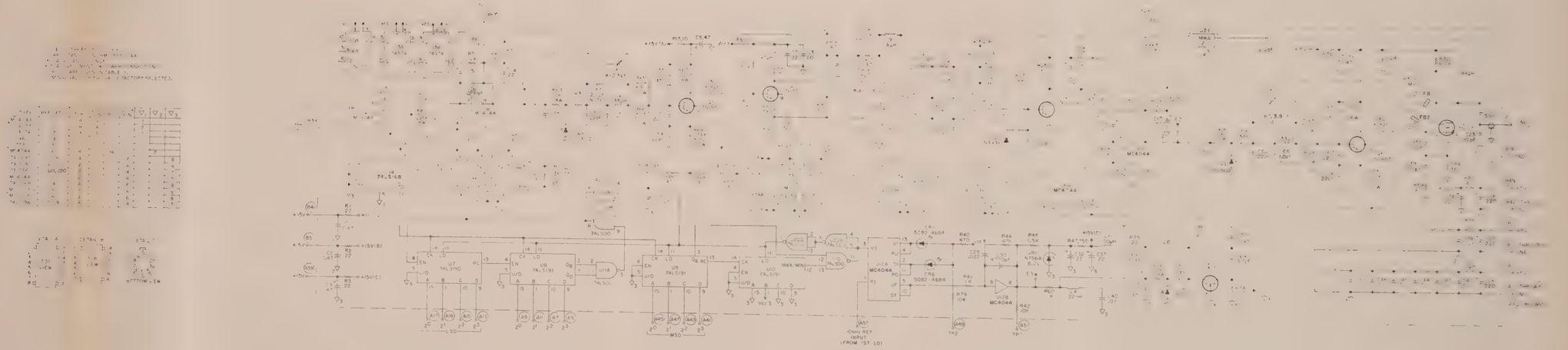


Figure 6-9. Type 796226-1, 2nd LO Synthesizer (A6), Schematic Diagram 680049 (E)

NOTES 1. UNLESS OTHERWISE SPECIFIED
a) CAPACITANCE IS IN μF
b) RESISTANCE IS OHMS, ±5%, 1/4W
2. PINS A37, A38, A39, A40, B17, B18, B19, B20, B55 – B60 ARE GROUND

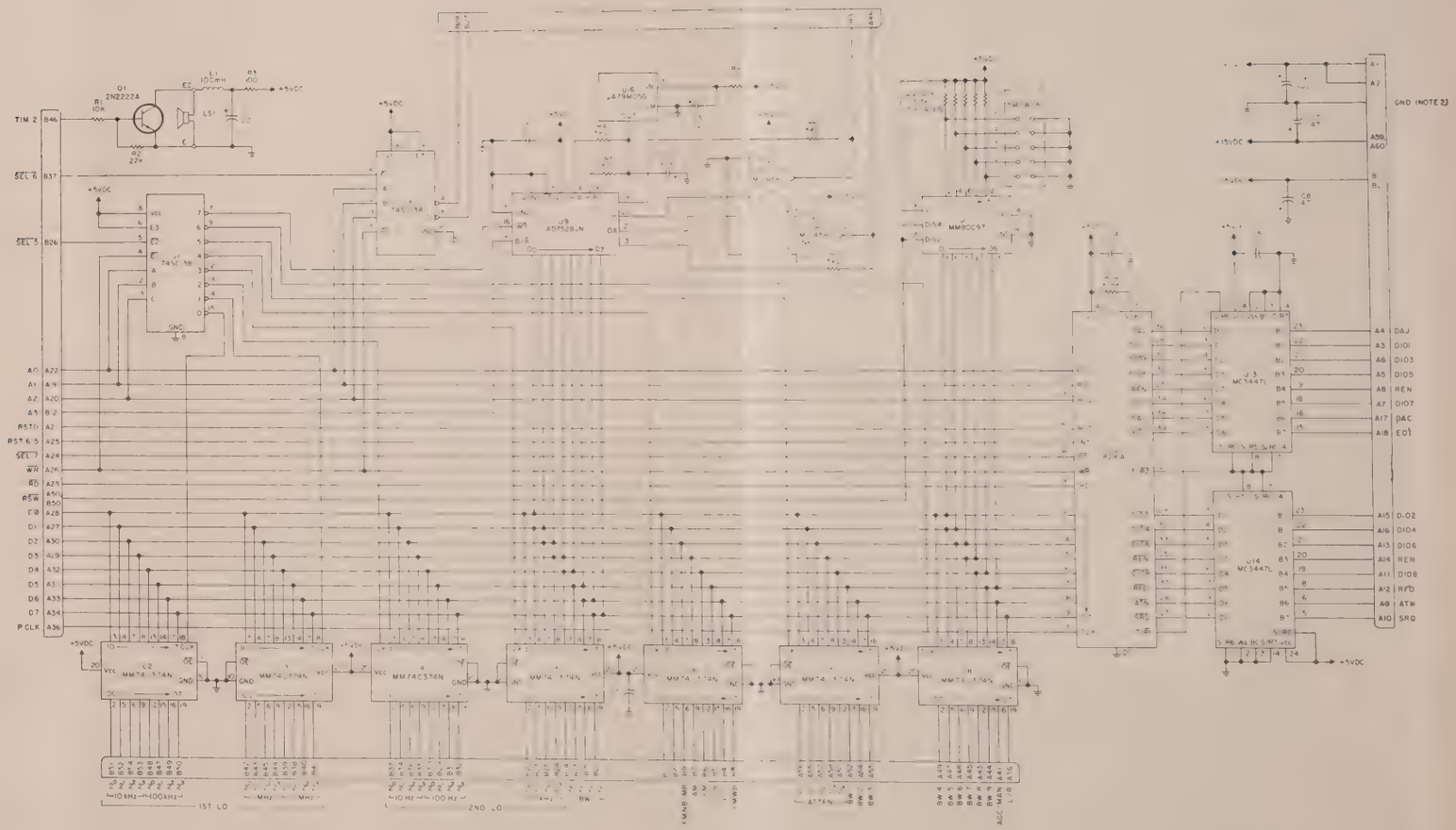


Figure 6-10. Type 796282-2, I/O Interface Assembly (A7), Schematic Diagram 580380 (C)

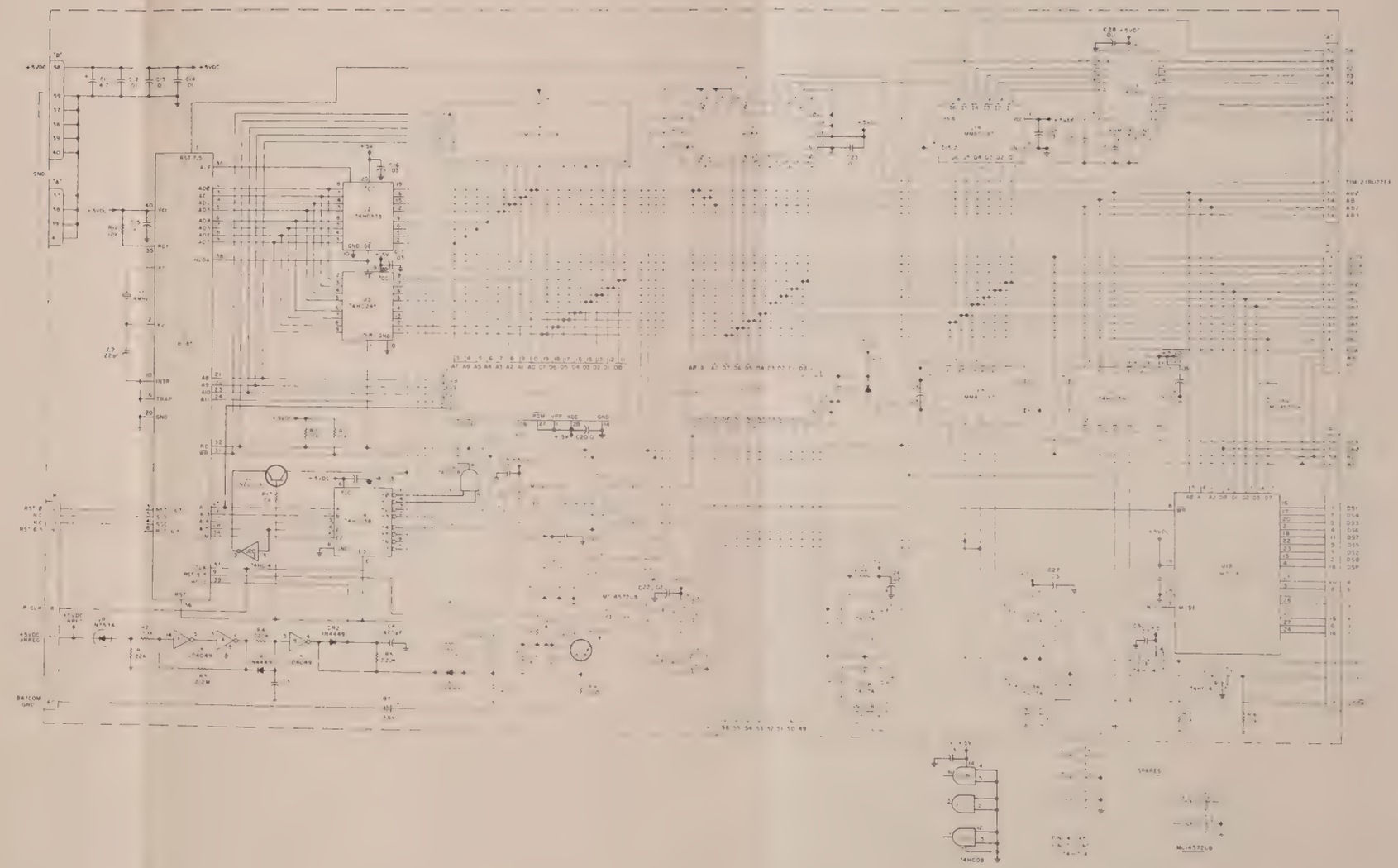
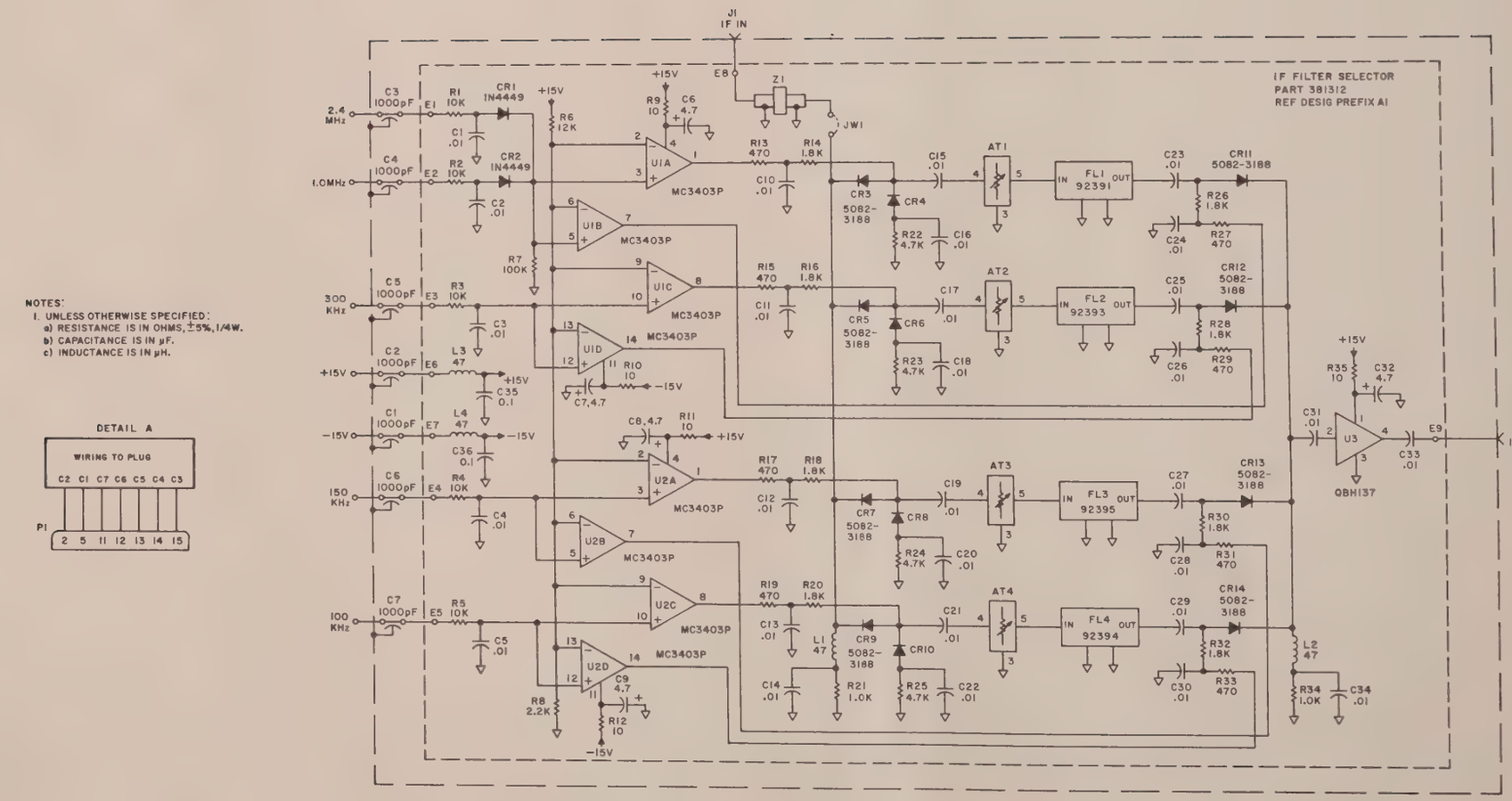


Figure 6-11. Type 796623-5, Microprocessor (A8), Schematic Diagram 680092 (C)



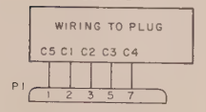
NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS IN μF.
   c) INDUCTANCE IS IN μH.

DETAIL A

Figure 6-12. Type 796649-1, IF Selector Assembly (A9), Schematic Diagram 481058 (05)

NOTES
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS IN pF.
   c) INDUCTANCE IS IN µH.
2. FOR WIRING TO PLUG, SEE DETAIL A.

DETAIL A



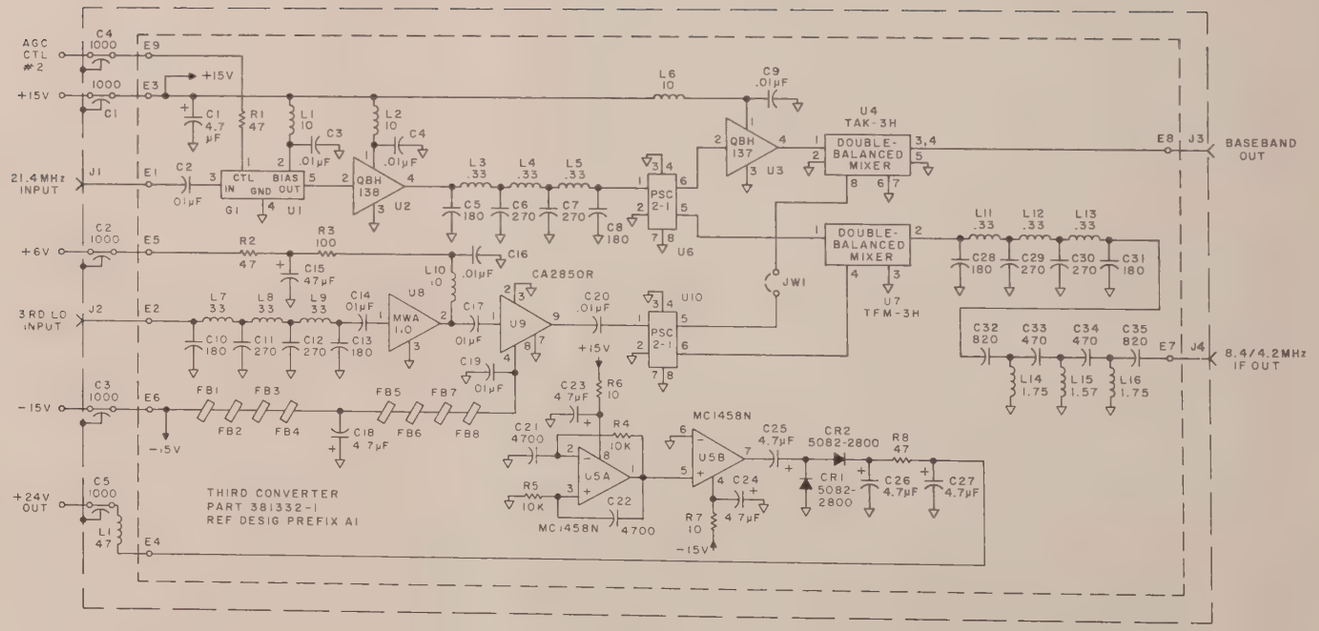


Figure 6-13. Type 796651-1, Third Converter Assembly (A10), Schematic Diagram 481060 (04)

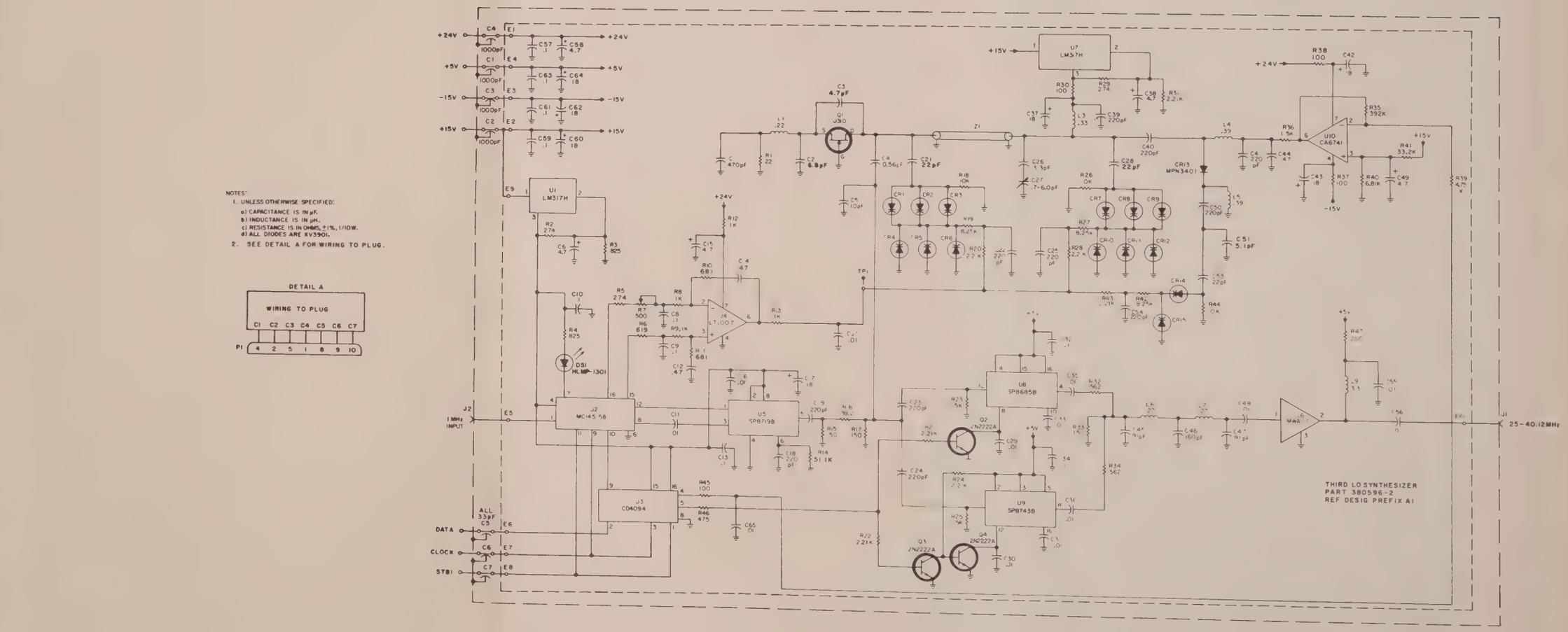
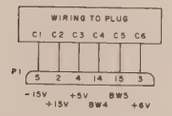


Figure 6-14. Type 796655-1, Third LO Synthesizer (A11), Schematic Diagram 580698 (04)

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   A) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   B) CAPACITANCE IS IN UF.



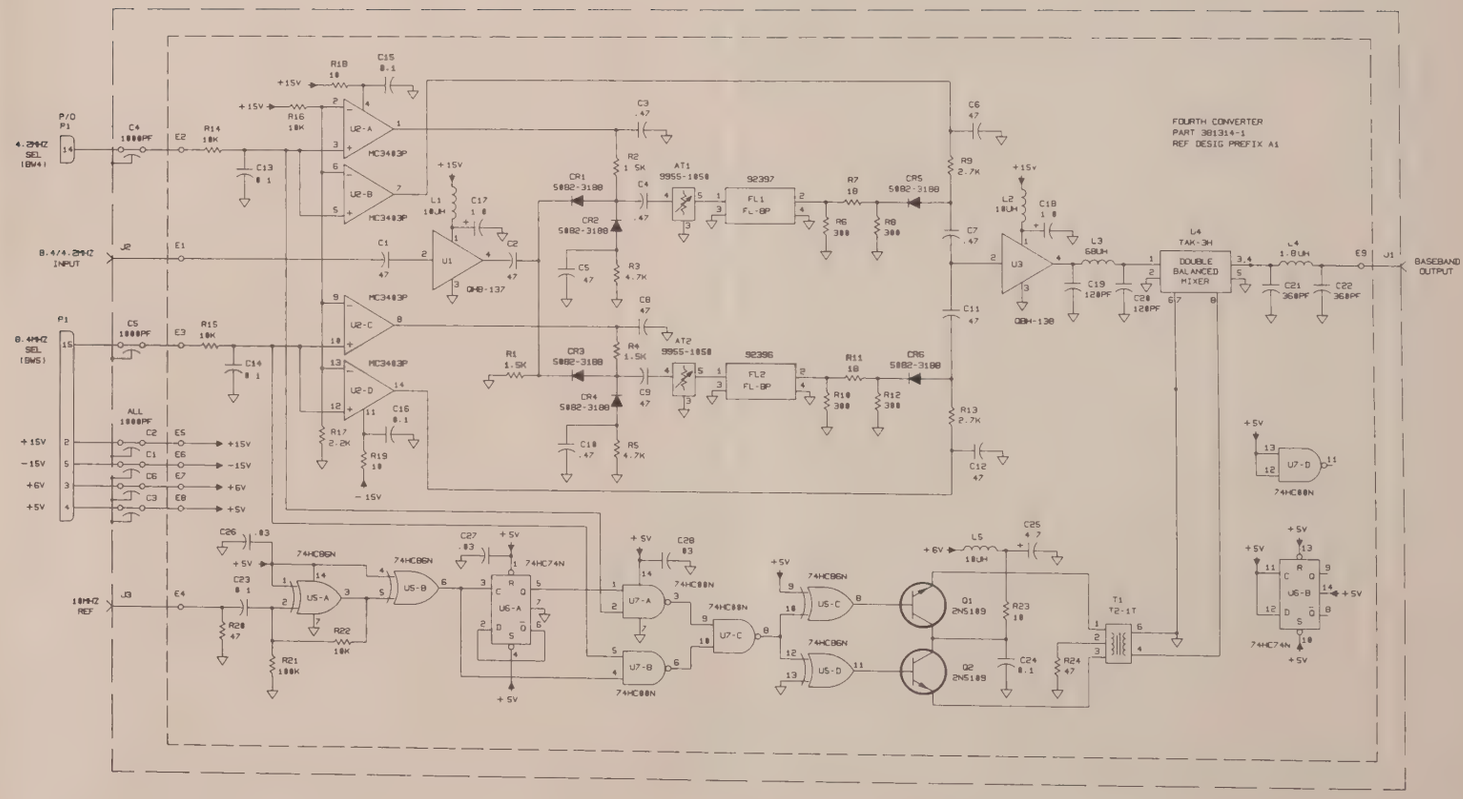


Figure 6-15. Type 796652-1, Fourth Converter Assembly (A12), Schematic Diagram 481057 (05)

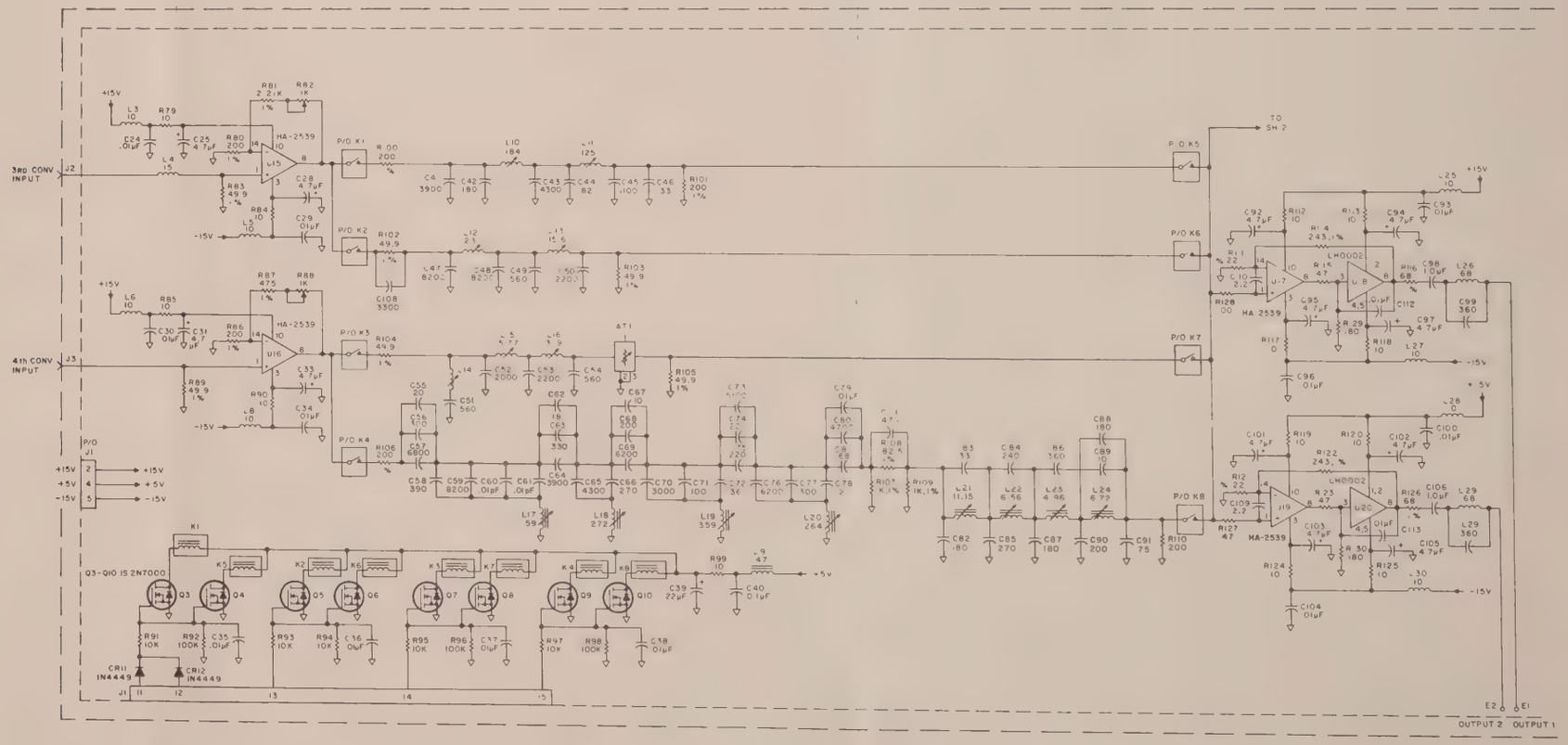


Figure 6-16. Type 481097-1, Output Filter Driver/AGC (A13), Schematic Diagram 580743 (Sheet 1 of 2) (06)

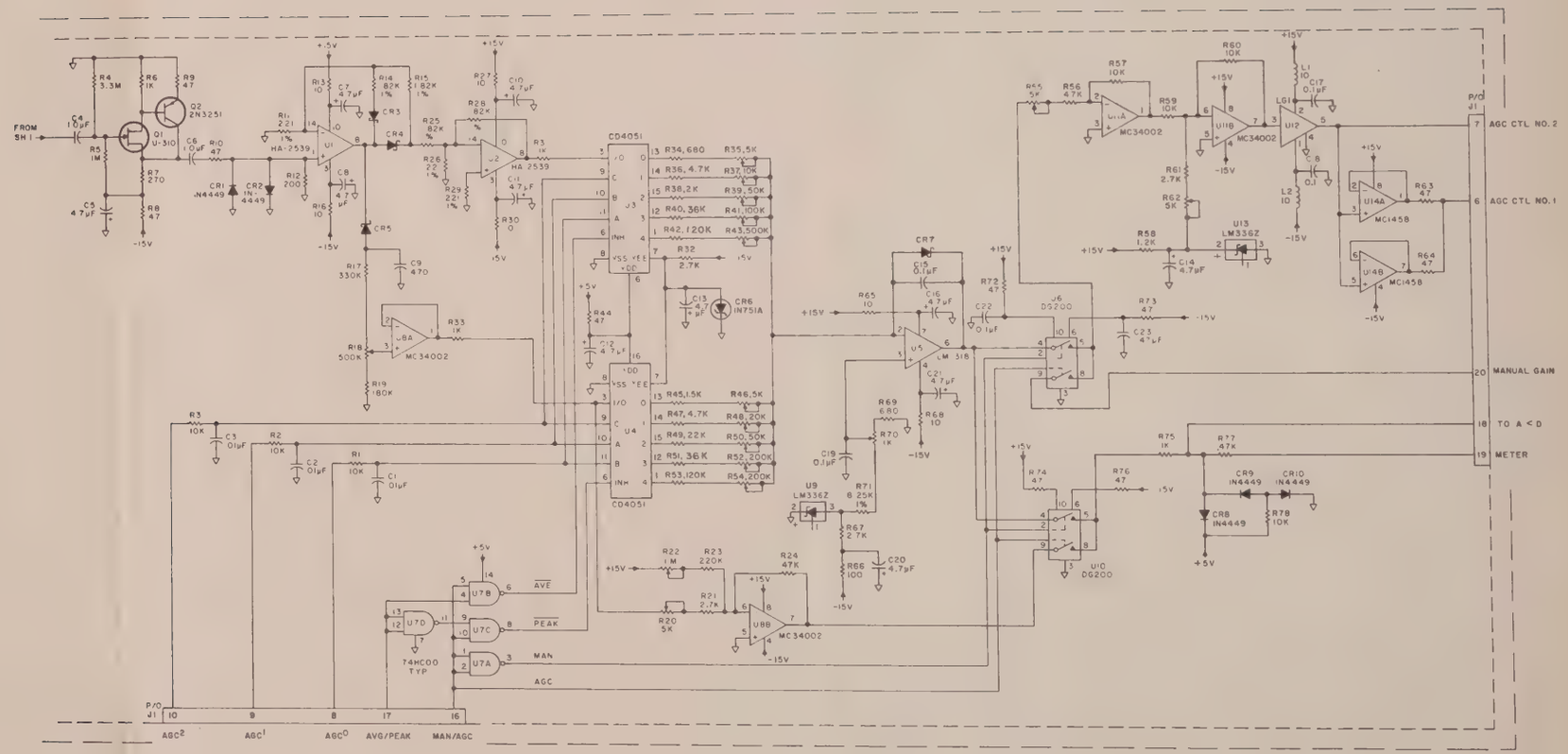


Figure 6-16. Type 481097-1, Output Filter Driver/AGC (A13), Schematic Diagram 580743 (Sheet 2 of 2) (06)

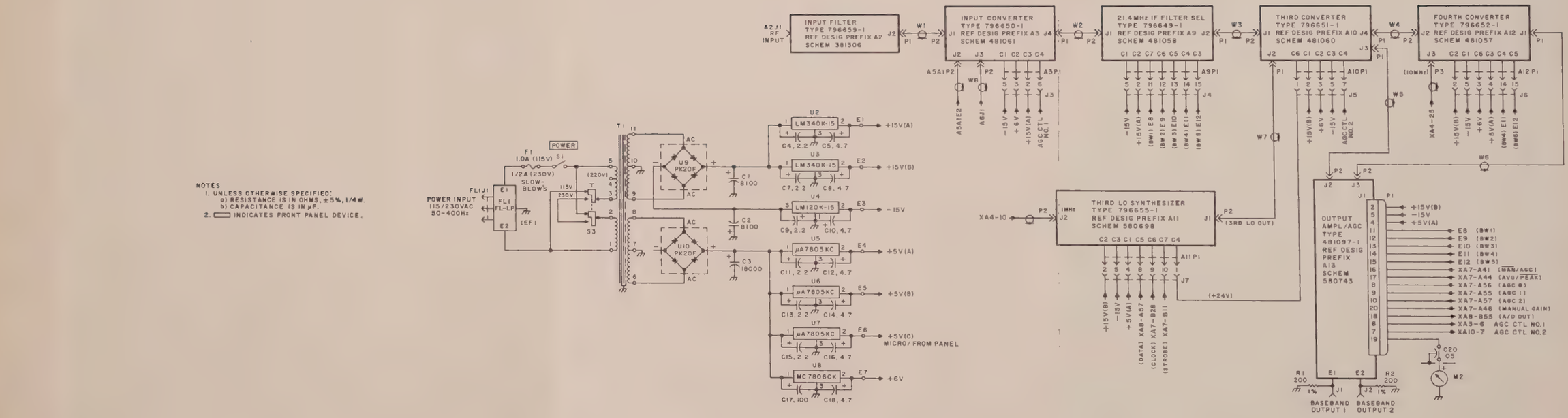


Figure 6-17. Type WJ-9478 Baseband Receiver, Main Chassis Schematic Diagram 580691 (Sheet 1 of 2) (06)

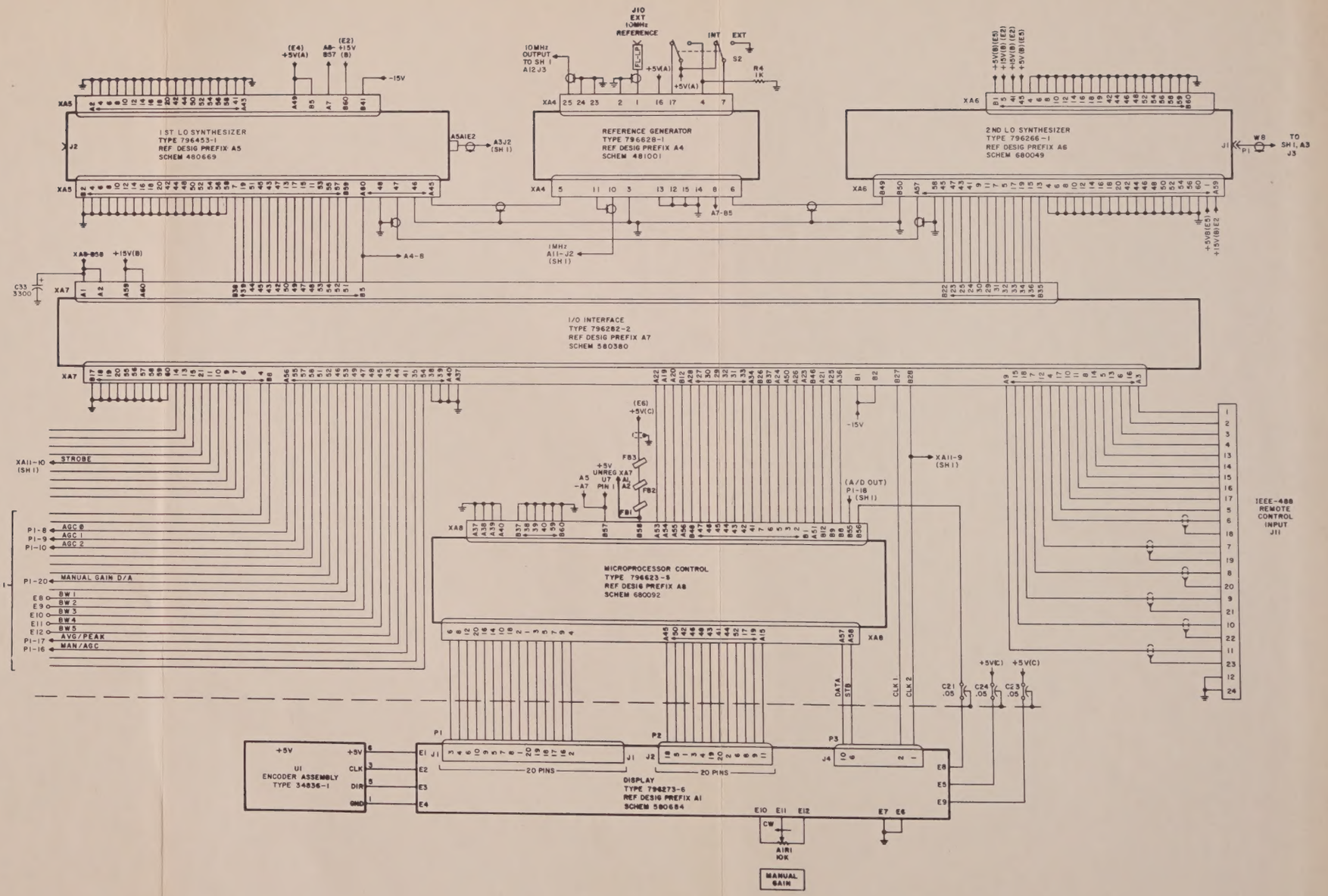


Figure 6-17. Type WJ-9478 Baseband Receiver, Main Chassis Schematic Diagram 580691 (Sheet 2 of 2) (06)

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